ARCHIVES OF OPHTHALMOLOGY.

ON INCISION OF THE EYE, WITH SPECIAL REFERENCE TO INCISIONS FOR THE EXTRACTION OF CATARACT AND FOR THE RELIEF OF GLAUCOMA.

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(With eight illustrations on Text-Plates, VIII.–XIII.)

THE history of the extraction of cataract records that almost every kind of incision that it is possible to make has been used at one time or another for the extraction of the lens; and most of these have been abandoned.

It is now 163 years since Daviel inaugurated the operation of cataract extraction, yet even now, after so long a period, finality of opinion and of procedure has not been attained as regards the incision most suitable for extraction. The matter is therefore worth examining; and is here investigated from four different aspects: the MECHANICAL, the ANATOMICAL and PHYSIOLOGICAL, the PATHOLOGICAL, and the TECHNICAL.

MECHANICAL.

Mechanical considerations appear to have been neglected, probably because medical men are not, as a rule, mathematicians. Yet we are here dealing with a problem which is largely one of mechanics. Here is a body bounded by two spherical surfaces and containing fluid under pressure; and the problem of what will happen when we incise this body in different directions is available for mathematical treatment.

Indeed I had no proper idea as to what does happen until I came to investigate the thing mathematically.

The cornea is a spherical cap; the sphere of which it is a part has a radius of *7mm.* The base of the corneal cap has a diameter of approximately *11mm.* These are internal measurements as we are here only concerned with the internal surfaces of the globe of the eye, because it is on these surfaces that the fluids of the eye exert their pressure.

In Figure 1, draw a line AB of 11 units, each unit to represent one millimetre. With A and B as centres and a radius of 7 units draw arcs cutting at O, and with O as centre draw arc ACB of *7mm* radius. The sclera has a radius of about *12mm.* With A and B as centres and radius of 12 units make arcs cutting at V, and with point V as centre and the same radius draw the arc AEB. Draw a straight line through O and V and produce it each way to C and E. The figure now represents to scale a median section of the wall of the eye. CE is the optical axis, AB the plane of the corneal base or corneo-scleral junction; point O is the centre of curvature of the cornea, and point V that of the sclera.

The eye is a closed vessel filled with fluid, for the vitreous, so far as mechanical considerations here dealt with are concerned, we may regard as a fluid. This fluid is under pressure which we will denote by P,—P being the number of units of pressure per unit area. As the effect of the force of gravity may be disregarded in the case of so small an object as the eye, P is everywhere the same within the globe owing to the well known property of fluids of transmitting pressure so that any surface in the fluid is pressed upon with a pressure P per unit area in a direction normal or at right angles to the surface. The direction normal at any point in the surface of a sphere is that of the radius of the sphere at that point. The pressure P then per unit area will be exerted uniformly over the internal spherical surfaces of the sclera and cornea in the direction of the radii from V in the case of the sclera, and of point O in the case of the cornea. The tangential component of the pressure is zero, because it is equal to P cos $\frac{\pi}{2}$, and cos $\frac{\pi}{2}$ = O.

The whole force of the pressure on the walls of the eye is thus exerted in straight lines radiating away from the re-

ILLUSTRATING CAPTAIN MCKECHNIE'S PAPER ON "INCISION OF THE EYE," ETC.

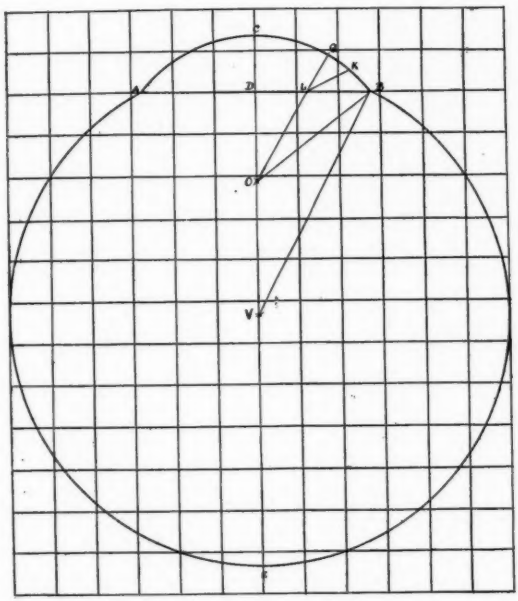


FIG. 1.—Eye: Antero-Posterior Vertical Median Section.

Arc ACB is internal surface of cornea in section.
Arc AEB " " " " sclera " "
AB = internal diameter of cornea = 11 millimetres.
O is centre of corneal sphere of which OB and OQ are radii of length 7 *mm.*
V " " " scleral " " " VB is radius of length 12 *mm.*
A and B mark corneo-scleral junction and D is centre of corneo-scleral plane.
C is anterior pole.
E is posterior pole.
L a point representing a line of puncture aud counter-puncture 2.5 *mm* from D—that is, the points of puncture and counter-puncture are on a line parallel to the horizontal meridian passing through the base of the cornea and 2.5 *mm* from it.
LB the corneo-scleral flap incision.
LQ the radial corneal incision.
LK an intermediate corneal flap incision.

spective centres of curvature of the walls and in no other direction.

Draw the corneal radius OQ, cutting AB in the point L, and let L be the site of puncture and counter puncture for an incision commencing in the corneo-scleral margin.

First suppose the incision to be carried out along LQ. It will be in the plane of a great circle passing through the centre of curvature O; and the arc LQ, the corneal wound, will be an arc of a great circle. What happens? The pressure P of the fluid within the eye acts in the direction of the radius from O. As regards the wound all these radii lie in the plane of the wound LQ. We saw above that the pressure on the surface at right angles to a radius was zero. Therefore there is no pressure on the edge of the wound at right angles to the plane of the incision, and therefore the wound will not gape. If truly linear and not too large, as large size would bring other forces due to the elasticity and tension of the coats of the eye into play, the wound will remain closed and will not allow the fluid within to escape, and P will not diminish.

The outward pressure along the arc of the great circle represented by a lip of the wound will keep the lip in a state of tension; and because the spherical form is that of static stability, the lip of the wound will retain its original shape, that of the arc of a great circle.

What happens then when the section LQ is made is this: the wound does not gape but closes, and retains the fluid within the eye even under pressure. The edges of the wound retain their shape as arcs of a great circle of the corneal sphere, remaining in close apposition and in a state of tension along their lengths, the tension being proportional to the pressure of the fluid within.

Now suppose the knife to cut out in a plane such as that of LK. Refer to Figure 2 which is on a larger scale than Figure 1, but with the same lettering. Join OB, OK, and VB. Let the angle LKO $=\alpha$. If we sum the forces acting along the arc of the wound, KL represents the direction in which the wound lips in tension can pull to counteract the pressure P, which acts along the radii of which, in direction, OK represents the sum. From any point M in OK drop a

perpendicular MN onto LK. Then if MK be taken to represent P in magnitude and direction, its components along LK and at right angles to LK will be represented in magnitude and direction by NK and MN respectively. The component of pressure NK leads to a tension KN which exactly neutralizes it. This force KN I will call the CLOSING COMPONENT. The component of pressure MN acts at right angles to LK, that is to the plane of the blade of the knife, and in the direction MN. The lip of the wound towards the A side of LK will therefore tend to move in that direction; LK will therefore tend to revolve about L till it lies in the direction LQ, in which position the component of pressure MN, which I will call the OPENING COMPONENT, would vanish, and the opening action would cease. Were the segment of cornea LKQ perfectly soft and flexible and were the pressure to be sustained for any length of time, this rolling back would actually happen and the gap QLK would be produced as soon as the incision LK was completed. But as the cornea has a certain amount of rigidity and elasticity, what happens is that the lip on the A side of LK gapes just sufficiently towards the position LQ to allow the internal pressure in the eye to become P = o. The lip of LK on the B side is subject to the same opening component MN, but in this case, having regard to the direction of MN, the OPENING FORCE is negative. If the lip were free to move, it would move towards the position LQ, being impelled to do so by the sum of the MN components acting over the surface of the segment between the directions OK and LK; but it is prevented from moving in the A direction by its attachment in continuity with the rest of the wall of the eye.

Between the planes of OK and OQ we have the total forces represented by NKs and MNs or ΣNK and ΣMN, and they tend to cause the area LKQ to vanish into LQ, and the area on the B side of LK to expand into LKQ. We thus see that the B side lip will tend to follow after the A side lip which tends to fold back into the position of rest along LQ. We have here a simple and sufficient explanation of the overriding which takes place during the healing of flap incisions for cataract. When the section is made there is no overriding because the pressure P has become zero owing to escape

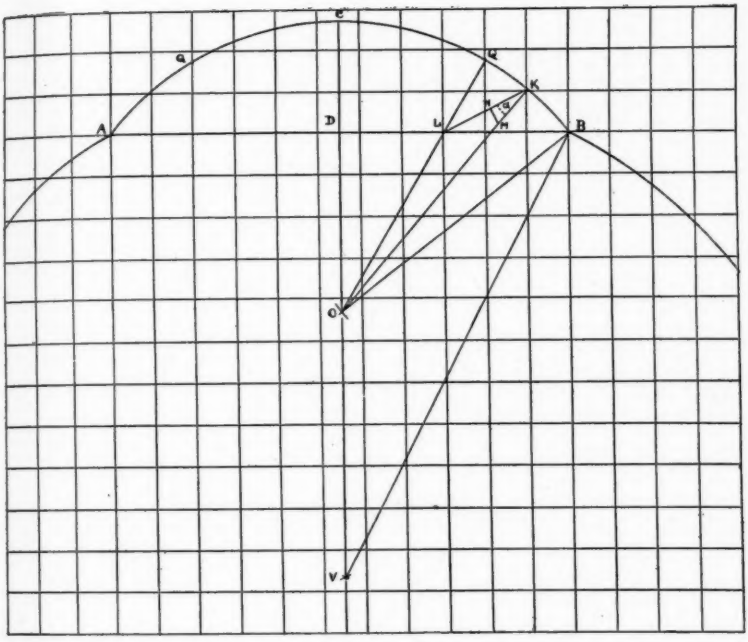


FIG. 2.—The same as in FIG. 1. Each large square represents 1 *mm*.

Point Q the apex of the radial incision LQ.
" Q′ a corresponding point.
QQ′ is parallel to AB and is 7 *mm* long.
∴ triangle OQQ′ is equilateral and angle Q′QO = 60°.
and angle QLM = angle Q′QO = 60°.
MN is perpendicular to LK.
Angle LKO = α.

of fluid from the eye, and it will remain zero so long as the wound edges do not adhere. When the process of repair causes the edges to adhere, the pressure is able to rise within the eye. Then the forces described above begin to operate, and as the material forming the line of union along LK is plastic it will allow the margin of the wound towards the B side, acted upon by the ΣMN on the B side of LK, to advance slightly towards LQ, whilst the opposite margin of the wound, tending to rise up and gape, will override it. The condition for this then is a plastic healing process in a flap incision, which, whilst sealing the wound and permitting of a development of pressure within the eye, is plastic enough to allow the margins of the wound to slide on one another.

The closing component $KN = KM \cos\alpha$; the opening component $MN = MK \sin\alpha$. Let K approach Q so that L K approaches to the position LQ. The angle α will evidently diminish. As an acute angle diminishes towards zero, its cosine increases and its sine diminishes in magnitude. Therefore as K approaches Q, the closing component $P \cos\alpha$ increases, whilst the opening component $P \sin\alpha$ diminishes, so that the wound has less and less tendency to gape. When LK coincides with LQ the angle $\alpha = 0$ and $\cos\alpha = 1$ and $\sin\alpha = 0$, so that here the closing component, $P \cos\alpha = P \times 1 = P$; and the opening component, $P \sin\alpha = P \times 0 = 0$, which is the conclusion previously arrived at when discussing the incision along LQ; this was that there will be no force acting at right angles to the plane of the incision causing the wound to gape, but that the whole outward pressure will be exactly met and neutralized by an equal and opposite tension. If K passes Q and proceeds farther along in the direction of A, the angle α will begin to increase in amount, but in a negative direction; its cosine will not change sign, but its sine will do so; the closing component remains $P \cos\alpha$, but the opening component becomes $P \sin\alpha$ with negative sign—that is, it acts in the opposite direction to what it did before. Hence it will be the B-sided lip of the wound which will now tend to gape and roll back, and the A-sided lip to come forward or contract underneath the other. Let us now consider what happens when K moves towards B. The angle LKO or α widens out or becomes larger. Its cosine will therefore diminish and its

sine increase, so that the closing component P cos α diminishes and the opening component P sin α increases. The wound will thus tend to gape more and more readily as K advances towards B. When K coincides with B we have the incision LB, the corneo-scleral flap incision. α is now the angle LBO. At B we reach a critical point. Here the corneal and scleral curvatures meet. In the case of the cornea the pressure is acting along OB, whilst in the case of the sclera it is acting along VB which has the effect of increasing the angle α enormously. The angle LBV, which is α for the case of the scleral curvature, is nearly twice as big as the angle LBO, which is the angle α for the corneal curvature.

The sines and cosines of these angles are easily calculated:

$$\text{Sin LBO} = \frac{OD}{OB} \quad \text{Sin LBV} = \frac{VD}{VB} \quad \text{Cos LBO} = \frac{DB}{OB} \quad \text{Cos LBV} = \frac{DB}{VB}$$

By the Pythagorean theorem $OB^2 = OD^2 + DB^2$ hence $(7)^2 = OD^2 + (5.5)^2$ and $OD = \sqrt{49 - 30.25} = \sqrt{18.75} = 4.3$. Similarly VD = 10.7 nearly. Applying these values we have:

$$\text{Sin LBO} = \frac{4.3}{7.5} = .57. \quad \text{Sin LBV} = \frac{10.7}{12} = .89. \quad \text{Cos LBO} = \frac{5.5}{7} = .79.$$

$$\text{Cos LBV} = \frac{5.5}{12} = .46$$

We can now compare the numerical values, for a given pressure P, of the opening and closing components of the incision LB, regarding it in the one case as a corneal incision and in the other as a scleral.

	Corneal Incision	*Scleral Incision.*
Opening Component =	P × sin LBO = P × .57	P sin LBV = P × .89.
Closing Component =	P cos LBO = P × .79	P cos LBV = P × .46.

We thus see that, if we compare incisions taken in the same direction and otherwise the same except that the one is in the corneal and the other in the scleral part of the corneo-scleral region, the magnitude of the force at the wound margin causing gaping in the case of the scleral incision is to the magnitude of the force causing gaping at the wound margin in the case of the corneal incision as .89 is to .57, or more than one and a half times greater; whilst the force tending to keep the wound closed, the closing component, is

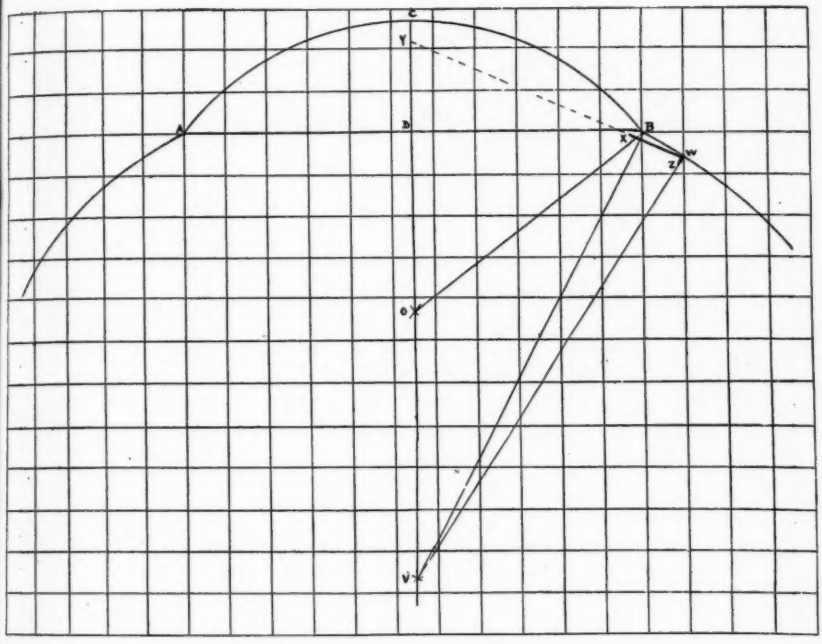


FIG. 3.—The same as FIG. 2.

W is the point of entrance of a knife into the anterior chamber through the sclera, one millimetre from the corneo-scleral junction B.
WV the direction of a radial wound of entrance WZ.
WXV " " " " " " WX making an angle of 70° with the radius WV of the sclera.

just about twice as great in the corneal case as it is in the scleral. We thus have a multiplied effect; the liability of the scleral wound to be opened by the forces acting on its margin is roughly $\frac{3}{2} \times 2$ or three times greater than that of the corneal; and it is all due to the difference of angle which the plane of the incision makes with the radii of curvature in the two cases respectively.

This I regard as important especially in its application to operations for the relief of glaucoma, and in its relation to the production of astigmatism in operations for cataract. We arrive at an explanation of the gaping wound and "filtering cicatrix" obtained in some cases of flap incisions taken in the sclera. It affords an explanation of how iridectomy, for glaucoma acts.

The successful operation is explained as follows: The operator, in order to get a broad iridectomy well back to the root of the iris, has inserted the keratome well back in the sclera at a point such as that represented by W (Fig. 3), and has made a broad wound. To do this without injuring the iris or lens, which are bulging forwards and making the anterior chamber shallow, the operator is obliged to turn the point of his keratome forwards so that its plane lies in some direction such as that represented by WY (Fig. 3), producing a scleral flap WX having a wide alpha angle, the angle YWV. The cosine of so large an angle will be a very small fraction, so that P cos α, the closing component, will be very small; whilst P sin α the opening component, will be large. There will be hardly any tension to pull the flap XW down into place, whilst nearly all the pressure P radiating from V as centre will be acting at right angles to the plane of the incision, thrusting the lips of the wound apart. The opening component in this case is P $\times$ sin angle YWV.

The angle YWV shown in Figure 3, which is drawn to scale, is one of 70°. Now sin 70° = .94 nearly, so that the opening component in the case illustrated, that of a good incision, is .94 $\times$ P, which, as I said before is nearly the whole of the pressure. The closing component P cos 70° = .34 P which is small. Compare the values given previously for angles LBO and LBV. The wound will be a particularly gaping one with very little tendency to close. It is likely to produce

a more or less permeable cicatrix which will keep the eye soft.

Except that the iridectomy prevents prolapse and incarceration of the iris, I do not see why it should be a factor in the result.

The farther back the knife is entered the larger in proportion will be the angle α, and hence the less will be the closing component and the larger the opening component.

The fact that the best incision is a scleral one is due to the scleral angle α being almost twice as big as the corresponding corneal one, and the opening and closing components are thereby largely affected as shown in the numerical example.

The fact that an operation sometimes does not relieve the tension and so fails in its object is explained thus: The operator had made a linear incision, probably with a Graefe's knife, in the plane VW. I have indicated such an incision by WZ (Fig. 3). The incision is in the plane of a great circle, the angle α is the angle $ZWV = 0°$ whose cosine is unity and whose sine is zero, so that there is no opening component. The incision, therefore, for the reasons already stated when discussing the incision LQ, will remain closed, and will prevent fluid from escaping even when under pressure, so that the tension of the eye will not be relieved.

The explanation of the fact that an operation sometimes relieves for a time but that the glaucoma subsequently recurs, is that the incision has been made intermediate in character between the bad linear incision WZ and the good scleral incision with flap WX, the α angle being between $0°$ and $70°$. Intermediate angles may allow the wound to pass fluid for a time, but eventually it closes impermeably, when, should the factors which cause glaucoma be present, the high tension can return.

In this connection one may read with interest the observations of Colonel Herbert, I.M.S., in his careful work on *Cataract Extraction*, edition of 1908. On page 71 when describing the making of his incision he says: "During the sawing movements attention is directed to the outlining of the conjunctival flap at either side, and this determines any slight forward or backward twist of the knife which may be necessary." On p. 79 he says: "We have to operate

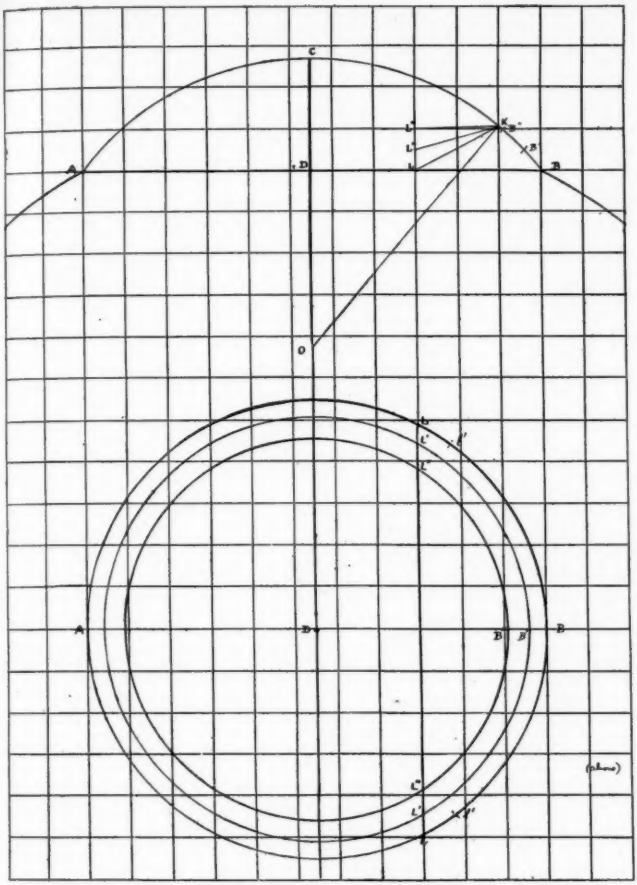


FIG 4.—The same as FIGS. 2 and 3.—The lower drawing is the projection in plan of the upper one.

UPPER DRAWING

L is puncture and counter-puncture in corneo-scleral margin.

L′ is same in cornea 0.5 *mm* in front of corneo-scleral margin.

L″ is same but 1.0 *mm* in front.

B, B′, and B″ are the projections of L, L′, and L″ onto the corneal surface BCA which give the radii DB, DB,′and DB″ (below) for the circles in plan.

LOWER DRAWING. The Plan of above.

LL the points of puncture and counter-puncture in the corneo-scleral margin on a line 2.5 *mm* distant from and parallel to the horizontal meridian passing through D, which is the centre of the corneal base.

L′L′ are similar points 0.5 *mm* more anterior.

L″L″ " " " 1.0 " " "

B,B′,B″ the projections of B,B′,B″ (above).

ALBL the internal corneo-scleral margin circle.

L′B′L′ and L″B″L″ corresponding circles in parallel planes 0.5 and 1.0 *mm* anterior to circle ALBL respectively.

l′l′ are points on circle ALBL giving a chord l′l′ of same length as chord L′L′ on circle L′B′L′.

AB = 11 *mm*. LL = 9.8 *mm* approximately.

OK = 7 " L′L′= 8.8 " "

(above) DL = 2.5 *mm* L″L″ = 7.1 *mm* approximately.

upon many eyes in which the provision of a conjunctival covering complete from end to end of the incision is specially indicated." Further on he remarks upon the incision necessary for this (p. 80): "The drawback to a large conjunctival flap is the separation of the wound which takes place afterwards." On p. 81: "The making good of any deficiency of the conjunctival flap necessitates turning the edge of the knife a little backwards in completing the sclero-corneal section."

These quotations show that this surgeon frequently makes incisions which must enter the sclera, and especially so at the apex of his incision, where he may turn the edge of his knife backwards, thus rotating its plane more or less into a plane of direction YW. Now see what he says as to results. Speaking of the healing of his incision with conjunctival flap he writes (pages 152, 153): "Temporary breaking down of the adhesion, re-emptying the chamber for a few days, *is not very infrequent.* If the conjunctival flap be *fairly long* as well as extensive, the gaping of the central portion of the underlying wound may be considerable—a millimetre or more across. Approximation of the surfaces may never be complete, and the permanent repair of the wound must then depend largely upon the episcleral tissue overlying and occupying the gap A 'filtering cicatrix' results, allowing aqueous to pass through to the subconjunctival tissue in the neighborhood, where it keeps up a permanent slight œdema."

Again on page 155 we find:

"Many of the operations had been performed with unnecessarily large conjunctival flaps. There were, consequently, many cicatrices certainly filtering and many others doubtful in this respect. . . . The ocular tension was normal or only slightly subnormal, but could be *reduced rapidly by pressure upon the eye.*" This condition would be just the thing to aim at getting in a case of glaucoma. Regarding astigmatism he says (p. 158): "The absence of any notable tendency to diminution of the astigmatism must be counted a definite drawback to the use of a large conjunctival flap." He mentions that astigmatism has reached as high as 7 dioptres.

I have quoted thus largely from Colonel Herbert's admirable

notes and remarks because they are evidently those of a painstaking, candid, and accurate clinical observer and may be relied upon, and because they appear to me to afford the clinical proof of my *a priori* theoretical deductions. The italics in the quotations are mine.

Gaping wounds evidently go with large conjunctival flaps, leading to soft and astigmatic eyes. Colonel Herbert's explanation I think is wrong. The explanation is that to get a large conjunctival flap, and especially a *long* conjunctival flap, the incision has to be made *scleral* and gets the effect of the large scleral alpha angle LBV instead of the corneal alpha angle LBO of about half the size. Further, if the blade of the knife be directed *backwards* before cutting out, it means that the plane of the incision is not that of LB but of some direction such as XW (Fig. 3), which has the effect of still farther increasing the size of the alpha angle at the apex of the incision, making it very suitable for a case of cataract with glaucoma.

With regard to astigmatism it would seem as if the size of the area of the flap, which is left with its normal lines of resistance weakened by the incision, has a bearing on its production in addition to the factors already considered. If this is the case, we see by a reference to Figure 2 that for a given site of puncture and counter-puncture such as L the size of the area of the flap LKQ—that is, the surface between the planes LK and LQ—will depend upon the length of the arc QK. The longer we make the arc QK the larger will be the area LQK; the shorter the arc—that is, the nearer the incision approaches to the radial one LQ, the less will be the amount of area deprived of its normal support, till when the incision is actually radial there is no area without its natural support. The more the incision diverges from a radial one the greater will be the area liable to astigmatism.

The drawing Fig. 4 is on squared paper, as are Figs. 2 and 3 for purposes of comparison. Each large square represents one square millimetre. The distances between the fine lines are easily measured by counting, and it is easy to get an accuracy up to one tenth of a millimetre, which is more than sufficiently accurate for all practical purposes. In Fig. 4 the upper drawing represents the same section of the

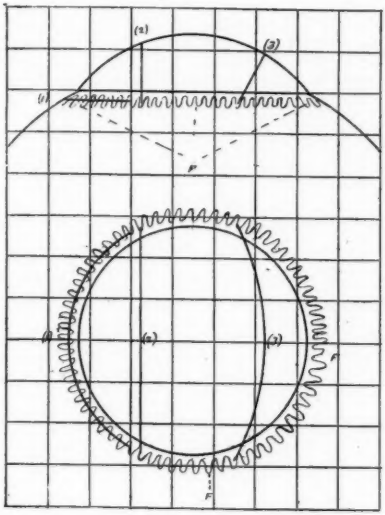


FIG. 5.—Elevation and Plan of Cornea, and adjacent fringe of vessels.

F the fringe of vessels.
(1) A corneo-scleral incision dividing vessels.
(2) Meridional " " few "
(3) Radial " " " "

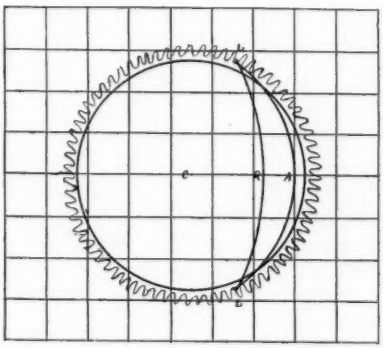


FIG. 6.

C the centre of cornea.
Q " apex of a radial incision LQL.
A " " " " flap " LAL.
F vascular fringe.

corneal region as do Figs. 1, 2, and 3. The lower drawing is the projection, in plan, of the points shown in the upper drawing. It is very easy by running the eye along the lines of the squared paper to pick up the corresponding points in the plan and elevation of the cornea, and to measure the distances between any points in plan or elevation by counting the intervening squares. Above in Fig. 4 the point L marks the site of puncture and counter-puncture, and below the two points are shown in plan, the distance between them LL being 9.8*mm* as can be confirmed by counting the lines or by calculation. Call the distance between L and L 2l. The distance of LL from the horizontal meridian is here taken at 2.5*mm*. The formula $R^2 = \sqrt{DL^2 + l^2}$ where R is the corneal radius, here 5.5*mm*, will give any measurement when the other is given. But for practical purposes the best way is to look at the diagram to get the measurements. Fuchs gives the diameter of the lens as 9*mm*, and its thickness as 5*mm*. Thus if we wish the incision to be 9*mm* wide we look at the diagram and we see that LL must be 3.2*mm* from D and 2.3*mm* from B. In the diagrams, 1, 2, 3, and 4, LL is 2.5*mm* from D, giving the width of LL = 9.8*mm*. If we wish LL to be 10*mm* the diagram (Fig. 4) shows that we must make the puncture and counter-puncture 2.3*mm* from the horizontal meridian. Whilst the full diameter of the lens can thus be provided for, it is otherwise with its thickness. If L is 3*mm* from B as in the diagrams and the cut be made along LB, the utmost the flap LB can roll back is to the position LQ, and in practice it could not easily do so without contracting the diameter 2l. If the flap were to fold back so far the gap would only be as big as LB or BQ, not more than about 3*mm* in extent, whereas the thickness of the lens is 5*mm*. Even were the incision begun at D and the whole of DB turned back, there would only just be room for the thickness of the lens to pass without distortion. It is thus seen that any practical incision entails that the lens should be squeezed or moulded through the opening made by the incision—that is, if the lens is to be removed entire. And I may here remark that after an experience of over 500 extractions of the lens in the capsule, there is no doubt left in my mind that the best way in which to extract the great

majority of lenses is in their capsules. But, whichever method we adopt, this moulding of the lens will be noticed. And the lesson to be learned is that the harder and less squeezable the lens, or the bigger the nucleus, the wider should be the provision for its exit. Mere size of the lens does not matter much. Clinically I have often seen big fat soft lenses squeeze through openings much smaller than themselves. On the other hand small atrophic lenses consisting chiefly of a large and comparatively rigid nucleus are often very difficult to extract even through a large incision.

Reverting to Fig. 4: as LL is 9.8*mm* it may be regarded as just sufficient to allow the 9*mm* of the lens to pass because, when the lens presents, the lips of the wound are thrust apart and put upon the stretch and the points of puncture and counter-puncture are thereby approximated. Now look at the puncture marked L′. This point, like L, is 2.5*mm* from the horizontal meridian, but it is 5*mm* anterior to the corneo-scleral margin. In the upper figure run the eye along horizontally and we find the point B′ where the horizontal projection of the point L′ meets the corneal arc ACB. This gives the radius DB of the dotted circle in the plan. The distance between puncture and counter-puncture is now shown by L′L′ on the plan and is equal to 8.8*mm*. This is now less than the diameter of the lens; and 1*mm* has been lost in the width of the incision by making the puncture half a millimetre more anteriorly. A similar width would be given by a puncture in the corneo-scleral margin at a point about 3.3*mm* from the horizontal meridian as is shown by the projection l′l′ of the points L′L′ onto the corneo-scleral circle LBL in the plan.

If we look at the puncture L″ which in the upper figure is 1*mm* from AB, its projection and that of its counter-puncture are at L″L″ on the circle L″B″L″ of the plan, and the distance L″L″ is seen to be 7.7*mm*, which is 2.1*mm* less in width than the corresponding corneo-scleral puncture. Projecting L″ onto the corneo-scleral circle we see that this width would be got by a corneo-scleral puncture nearly 4*mm* from the horizontal meridian.

The diagrams therefore show very well the great loss in room entailed by making puncture and counter-puncture in

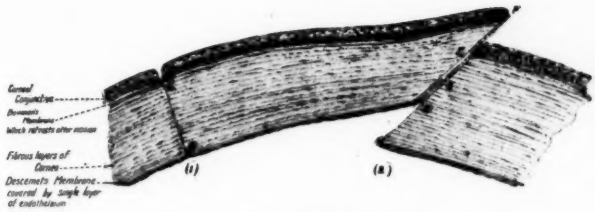


FIG. 7.—(Diagrammatic).

(1) is the healing of a radial incision which has gaped and is over-riding.
(2) " " " " flap "
BC parts which are uniting. Notice the length and linear character of (1), the shortness and width of (2).
AB and DF parts which have nothing to unite with.
CD part covered with epithelium, preventing union.
EF " " " " " "

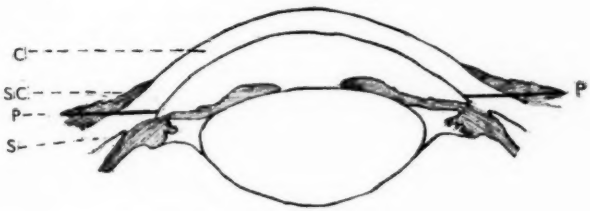


FIG. 8.—(After Meller).

C is cornea. S is sclera.
SC scleral conjunctiva.
PP line of puncture and counter-puncture.
Note the position well back at the margin of the anterior chamber.

front of the corneo-scleral margin, and indicate that if it is desired to get a roomy incision the knife must be entered as far back as possible.

But this is not all. The upper diagram clearly shows that when making a flap incision LK the alpha angle LKO is the more increased the more anteriorly we make the puncture and counter-puncture. Thus angle L″KO, is greater than angle L′KO, which itself is greater than angle LKO. In fact angle L″KO is nearly double angle LKO so that the incision L″K is a much more flap-like incision than is LK.

To sum up: an anterior position of the puncture and counter-puncture makes a wound narrower in width and more flap-like and gaping than does a more posterior position, when we take the same distances from the horizontal meridian of the cornea for the beginning and the end of the incision in each case.

ANATOMICAL AND PHYSIOLOGICAL.

For purposes of description I will call the apex of the cornea the anterior pole of the eye, whilst the macula would be the posterior pole. Great circles passing through these poles will be called meridians, whilst circles parallel to the equator will be called equatorials. The anterior chamber becomes rapidly shallower as its periphery is approached, where the anterior plane of the iris meets the sclerotic, forming the angle of the anterior chamber. Incisions opening the anterior chamber in the neighborhood of this angle are therefore more likely to damage iris, ciliary body, suspensory ligament of the lens or lens capsule than when placed more anteriorly. On account of this proximity also, it is easier for iris or pieces of lens capsule to become included in wounds in this region.

The posterior part of the corneo-scleral zone is the site of the fringe of capillary loops which terminate the meridionally placed ciliary arterioles. An equatorially placed incision—Fig. 5 (1)—in this situation will cut the greatest number of loops, whilst a meridionally placed incision—Fig. 5 (2)—will cut the fewest. *Pari passu* with inclusion of the conjunctiva scleræ in the incision additional vessels are cut, and these

are of a larger calibre. The nearer the clear cornea is approached the smaller and finer are the vascular loops.

Other things being equal, then, bleeding will be greater the more scleral and the more equatorial the incision, whilst bleeding will be less the more corneal and the more meridional the incision. The more the conjunctiva scleræ is cut the greater the bleeding.

The transparent cornea is nourished by lymph transuded from the capillary circumcorneal fringe. This lymph permeates the cornea by its lymph channels, and the fibres lie in lymph and are nourished by it in just the same way as fibrous tissue is in other parts of the body.

The diagram Fig. 6 represents the cornea surrounded by its capillary fringe. In the intact cornea the centre C is the part farthest from the source of lymph. But if an incision such as LAL be made, or like (1) Fig. 5, the part at A will be farthest from the supply of lymph. Its usual supply from the adjacent capillary loops has been cut off by the incision, which not only directly severs the lymph channels but also leads to their occlusion by the swelling of the cut corneal fibres which is produced by contact with the aqueous humor. The corneal fibres are normally bathed by the lymph with which they are isotonic. When brought in contact with the aqueous, which has a lower specific gravity than the lymph, osmosis takes place; they imbibe fluid and so become swollen. The fibres cannot swell without blocking the lymph channels, and so the lymph is prevented from being absorbed, or from oozing out at the cut edges. And here I would like to make a parenthetical hypothesis. It is that the haziness and fog and striæ of the cornea which sometimes occur after operations is caused as follows: the anterior chamber is opened; the aqueous is in contact with the cut edges of the cornea; stroking or other movements are made in such a manner as to drive and squeeze the lymph in the cornea towards the wound where it escapes at the cut edge. The milking movements being suspended aqueous becomes sucked by capillary attraction into the emptied corneal lymph channels; it gains entrance at the cut margin of the cornea where the lymph got exit; not being isotonic with the corneal fibres it causes them to swell and alters their homogeneity with respect to

light so that diffraction is caused and a consequent loss of transparency.

To return to the incision LAL. The sources of lymph nearest to A are now at L and L. Let LQL (Fig. 6) represent the arc of a great circle between L and L. Then the arc LKL is the shortest distance on the spherical surface between the points L and L; and hence for a puncture and counter-puncture at L and L the incision LKL, that is a radial one, has the margins of its wound the nearest possible to the nutrient blood supply. Incisions on either side of this, towards C or A will have one margin of the wound farther from the blood supply than the radial incision LKL, and the distance for one margin will be the greater in proportion to the amount of the deviation from the radial position.

The circulus iridis major lies posterior to the corneo-scleral margin and to the angle of the anterior chamber. A Graefe knife entering the anterior chamber in the region of its angle and in a plane anterior to that of the iris will avoid wounding this arterial circle, whilst if entering as posteriorly as the plane of the iris it will almost certainly cut this circle, an accident which causes considerable bleeding. A radial incision, therefore, begun anteriorly to the plane of the iris will cut a few vessels of the capillary order, if any, and will leave the margins of the wound the least disturbed as regards nourishment.

PATHOLOGICAL.

The swelling of the corneal fibres and the arrest of the lymph stream after incision of the cornea have been already alluded to. When this occurs in a radial incision, it will cause a rapid sealing of the wound which will not readily open again. The lips of the wound become gummed and jammed together in their natural position without deformity of the corneal surfaces as a whole. The surface epithelium will grow down into the crack left by the retraction of Bowman's membrane and will then join with its fellow of the opposite side. The depression then becomes elevated by growth of tissue from below till a smooth and even surface is produced; and but for the thin line of opacity and the gaps in the elastic membranes there is a complete *restitutio ad integrum* of the cornea,

which becomes as strong as it was before. The case is different when the wound gapes; not only is the cicatrix broader, but the epithelium gets time to grow down farther on the cut edges of the wound so as to cover the deeper layers of fibres, so that the whole thickness of the cornea cannot unite at the same time, as it will do if the wound does not gape and its edges are opposite to one another. A flap-like wound, which is also the kind which tends to gape as shown in the mechanical section, has the farther disadvantage of the overriding by the flap before alluded to. Hence corresponding surfaces are not united together; the deeper part of the edge of the flap tends to unite with the more superficial part of the opposite margin of the wound. There is consequently a prolonged weakness of the cicatrix which may, indeed, be permanent in bad cases; astigmatism is also produced as a consequence.

The diagram (Fig. 7) is designed to bring out these points. Case 1 is a healing radial incision. Case 2 is a healing flap incision which has gaped and which is overriding. The part BC marks where union has taken place. Contrast 1 and 2. In 1 we have direct union of the whole thickness of the fibrous layers of the cornea and no distortion. In 2 there is union over a limited area. The part AB has nothing with which to unite. The part CD becomes covered with epithelium during the gaping of the wound and the part EF becomes covered with epithelium and has nothing with which to unite. A wound such as 2 will take longer to heal and will be more delicate and liable to burst open than a wound such as 1. It will evidently also cause astigmatism. Another disadvantage of a wound healing as does 2 is that it is more liable to microbic infection. It presents an elevation above the surface of the cornea and a deep groove beneath it which permits of foreign material obtaining a lodgment and shelter from the cleaning action of the eyelids and tears. Moreover the upper part EF until covered by growth of epithelium is an open raw wound.

The question of infection of the operation wound is of great importance. It is so important that having determined to incise the eye, the liability to infection is the first thing to be considered when deciding upon the choice of method. The fear of infection has led many, perhaps the majority of sur-

geons, to abandon for the purpose of cataract extraction corneal incisions which are uncovered by conjunctiva. They base their practice on imitation of others and on the experience which was gained in the pre-antiseptic era. This experience is reported to have been that suppuration of the wound occurred more frequently when the incision was corneal than when it was underneath the conjunctiva. But, on the other hand, it is also reported that there were more cases of iridocyclitis by the latter method. It is thought that the conjunctiva by covering the wound will save it from infection; and also it is thought that a peripheral position of the wound gives it the protection of the very adjacent blood-supply, whilst central incisions are farther removed from the bactericidal blood-stream. The question is to be settled by experience; but there are also some arguments which it may be worth while to advance in dispute of the above contentions.

As regards experience: my own extends to about 500 cataract extractions without a conjunctival flap. I had two cases of suppuration. Both were in the same patient, operated on at the same sitting, and were probably due to an error in technique. It was one of my first twenty cases, and my lack of skill probably caused me to infect an instrument on an eyelid or some other part of the patient.

As regards theoretical considerations: the fear of infection based upon the results reported before the era of Pasteur is somewhat of the nature of a bogey in these days, especially when one knows that in those days no kind of wound was safe from suppuration. The cornea appears to me to heal as quickly and as easily as any other kind of connective tissue. A conjunctival covering of the wound will probably tend to prevent subsequent infection of the wound; but not more so, it seems to me, than the agglutination of the swollen fibres of the cornea itself, such as takes place when one makes a radial incision. But what about infection of the wound occurring at the time of operation? *That*, it appears to me, is the principal danger. Most wounds which go wrong are probably infected at the time of the operation. It is very easy to infect an instrument on an eyelid or other part during an operation. If one watches an unskilled operator one sees him doing it. It requires but the merest touch, the brushing of an eyelash,

to convey germs onto the instrument and hence into the wound, the raw surface of which may be well rubbed by the instrument. Covering up such a wound with a conjunctival flap will conceal it; it will not prevent or remove the infection which, if virulent enough, will cause suppuration despite the covering. True the covering may conceal the suppuration and the case may be called irido-cyclitis as it was in the old days, but the result is the same to the unfortunate eye. Indeed the covering might be harmful, by directing the infective process inwards instead of letting it get out. Again the surface of the cornea is more efficiently cleaned by tears than is the scleral conjunctiva, so that germs are more likely to be adherent to the scleral than to the corneal conjunctival surface; thus the very cutting of the scleral conjunctiva may infect the knife more readily than cutting the corneal conjunctiva, which infection might be carried to the deeper parts of the wound. That suppuration does not oftener occur is probably due to the deep parts being able to dispose of germs so long as they are not too virulent in quality nor too large in quantity.

The deep layers of the cornea possess the requisites for dealing with infection. We know that germs are first of all acted upon by the complement of the blood or lymph and then swallowed by the leucocytes if not dissolved by a lysin. Complement is contained in lymph or blood-serum to the same extent as in blood-plasma. All the fibres of the cornea are bathed in complement-bearing lymph; the lymph also contains leucocytes; and when required these increase in number. A reflex stimulus opens the sluice-gates of the circumcorneal arterioles, and lymph and leucocytes in quantity are available at the site of injury.

The point as to the distance of the site of injury from vascular loops has been dealt with in the section on anatomy and physiology; and the proposition that a peripheral wound is nearer the blood-supply is shown to be not true in the case of flap-like wounds. In these one margin is farther away than it would be if the wound were not so peripheral.

In my opinion the surgeon who operates skilfully on an eye with healthy appendages, and who does not infect his instruments during the course of the operation, nor allow

his own or his assistant's saliva to be projected onto the eye, has little to fear from suppuration of his incisions wherever placed; and he may incise the cornea covered by corneal conjunctiva with as much confidence as that covered by the scleral conjunctiva.

The pathology of inclusion of iris, capsule, lens matter, and vitreous in the wound has been so often dealt with that I have nothing original to note about it. Every one will admit that if by a certain planning of the incision these accidents can be minimized it is desirable to so plan the incision; provided always we can do so without neglecting other equally important considerations.

TECHNICAL.

A few points deserve consideration under this heading, though it is not intended to discuss the whole of the technique of incisions of the eye. The theory of the preceding sections shows that the best incision for the extraction of cataract will as a rule be a radial corneal one. Indeed the arguments so far brought forward are so overwhelmingly in favor of it that it immediately occurs to one to surmise that there must be some grave practical objection to its use, or otherwise it ought to have been generally adopted long ago. The possible objections, so far as I can think of, are three:

1. Interference of the scar with vision.
2. Difficulty or impossibility of extraction through the incision.
3. Difficulty of making the incision.

I suspect that one or more of these, or a combination of them, has stood in the way of the incision. I will examine them seriatim.

1. INTERFERENCE OF THE SCAR WITH VISION.—This is the question upon which the future of the incision will be decided; not on account of astigmatism due to proximity to the pupil as many have thought, because I have shown that a radial incision does not produce astigmatism, but because of the opacity due to the scar in the neighborhood of the pupil.

If one refers to Fig. 2 it is manifest that the radial incision LQ will give a clear cornea in front of a pupil 7*mm* in diameter

QQ'. It is only exceptionally that the pupil is dilated to this extent. But the scar will have a certain width along meridional arcs, so that there will be a slight encroachment on this account. But it will be only slight if the incision is cleanly and properly made. If we imagine the scar to be *2mm* wide we will be imagining a very wide scar for a radial incision. With the close approximation of the wound margins obtained in a cleanly cut radial incision such a width is not to be expected. But supposing such a width it would only mean an encroachment of *1mm* on the pupillary side of the scar, thus reducing the possible diameter of the pupil with clear cornea in front of it to *6mm*. But *6mm* is ample for ordinary dilatations of the pupil.

As a matter of fact a scar due to an incision such as LQ (Fig. 2) is practically wholly covered by the upper eyelid, and is not visible from a cosmetic point of view; and the cornea in which it lies does not, as a rule, give passage to rays of light which are used in vision. But for these favorable conditions to be obtained it is essential that the pupil should remain central. If the iris prolapses into the wound, or if the vitreous prolapses and becomes adherent to the wound, there will be more or less drawing up of the pupil. One often sees cases where even the usual very flap-like peripheral incisions have not been far enough removed from the pupil to prevent its being drawn up right under the apex of the scar at the periphery of the cornea. In these cases the pupil follows after the incision as if guided by some malign demon. The truth is that no incision can escape this danger if either iris or vitreous be included in the scar; and the only advantage which the peripheral incision has is that if the prolapse be but slight and the effect on the pupil but slight, it will not be drawn up far enough to be interfered with by the scar. But it will be interfered with by the upper eyelid, which comes to much the same thing. And the peripheral incision has this disadvantage, that the more peripheral it is the farther is the pupil likely to be drawn up in any given case, leading to more fixation and stretching of the iris, and a more unfavorable condition in the event of an optical iridectomy having to be performed subsequently. Whereas a radial incision like LQ has this great advantage over all others that, both

owing to its position and to its direction the chances of iris or vitreous healing in the wound are reduced to an absolute minimum.

I did not become fully alive to the advantages of a radial incision till I had written the previous sections, and although I have practised it since, I have not done it in a sufficient number of cases to justify the publication of results. This I hope to do at some later date. But I may say that so far it has fully justified my expectations.

2. DIFFICULTY OR IMPOSSIBILITY OF EXTRACTION THROUGH THE INCISION.—The incision LQ shown in Figure 2 gives a width for exit of the lens of 9.8*mm.*; and in practice I have found this to be sufficient to allow of the lens being delivered entire in its capsule. I have designed the incision in order to admit of this, which is the ideal operation for most cataracts. Extraction in the capsule requires more room for the exit of the lens than any other operation. In the cases in which I have done extraction in the capsule through a radial incision I have extracted the lens without undue difficulty and without any complications. But there is only just room. The incision must be placed as LQ and have the puncture and counter-puncture well back in the angle of the anterior chamber so as to get sufficient width (see Fig. 8). Then by suitable manipulations the spherical form of the eye is destroyed, which permits the wound to gape sufficiently to give exit to the entire lens in its capsule. (It is obvious that so long as the eye retains its spherical form the radial wound cannot open at all.) When the manipulations are over and the lens out, the spherical form becomes quickly re-established and the wound is closed of necessity, rendering that bugbear of the operator, subsequent prolapse of iris or vitreous, a thing of difficult occurrence.

Those operators who extract with capsulotomy need not adopt quite so large an incision. They must judge each case on its merits, remembering that the larger and harder the nucleus of the lens the wider must be the base of the incision. The smaller the nucleus of the lens, the nearer to the point B (Fig. 2) the puncture and counter-puncture may be made. So long as sufficient room is obtained for the passage of the nucleus, the nearer the incision can be brought to the upper

margin of the cornea the easier it will be to express the débris of the upper segment of the lens. With an incision such as LQ (Fig. 2) it will be difficult to express the débris from beneath the segment of cornea LBQ. There will be a tendency for fragments of lens matter to accumulate in this region, and downward pressure and stroking will be required to express it. A radial incision such as Von Graefe's one or one intermediate between Von Graefe's and the radial incision LQ of Fig. 2 according to the size of the nucleus seems to me to be the best adapted to the requirements of those who extract with capsulotomy.

The real cause of the abandonment of Von Graefe's incision was probably because operators did not obtain enough room. It is very easy to make the mistake of entering the knife, not in the angle of the anterior chamber as it should be in order to get the full width of incision as shown by the plan in Fig. 4, but anterior to this. The nearer we approach the upper limit of the cornea (B) the greater will be the effect of an anterior position of the puncture and counter-puncture in diminishing the width of the incision. Unless this fact be carefully borne in mind the operator is almost sure to make his incision too small, so deceptive is the appearance of the relations of parts near the limbus of the cornea. The puncture should be begun well over the sclera so as to enter the anterior chamber at its angle; and Von Graefe's description of how he made the incision by pointing the knife towards the centre of the pupil seems to me to have been unfortunate, as it tends to induce operators to make the puncture too anteriorly. It is, I think, because Graefe's incision was wrongly made that it has fallen into disrepute; and I am inclined to think that those surgeons who practise the capsulotomy operation should revert to Graefe's radial incision for lenses with small nucleus and make radial incisions placed between that of Graefe and my own for hard lenses with larger nuclei.

3. DIFFICULTY OF MAKING THE INCISION.—Here again this incision has an advantage over others. Properly executed it is easier to make than the corneo-scleral flap, and especially in those cases in which the corneo-scleral incision is difficult. And this brings me to the points in technique proper to which I wish to allude.

Execution of the radial incision (LQ Fig. 2) for the extraction of cataract in the capsule.

The conjunctiva is grasped in the vertical meridian immediately below the cornea. It is important that the grip should be exactly opposite to the intended apex of the incision—that is, that the points of the fixation forceps and the apex of the incision should be on the same meridian.

The eye is pulled well down, but *no pressure* is put upon it by the forceps. This is exceedingly important, as pressure may baffle the operator by causing the iris to bulge forward and entangle his knife; or he may even injure or dislocate the lens and so bungle his operation at the outset. An ivory-handled Graefe knife (I hate metal ones and can't imagine why they are made, because he who boils his knife blunts it. Are we to be dominated by the shibboleth "Aseptic Metal Handles") is delicately grasped, not near the shoulder as is commonly taught, but well away from it so as not to cramp the fingers as they thrust the knife through the eye. The knife is held very lightly by the fingers and thumb which should alone give it its motion. The hand is conveniently supported on the patient's head. The plane of the blade should be in the plane of LQ.

A reference to Fig. 2 will show that $OQ = OQ' = QQ' = 7mm$, so that OQQ' is an equilateral triangle, and angle $Q'QO$ is 60°, and as QQ' is parallel to AB the angle QLB is 60° or ⅔ of a right angle. Hence the knife should be entered with the plane of its blade at an angle of 60° to the plane of the corneo-scleral margin. This angle being two thirds of a right angle makes it very easy to judge, which is a convenience. The long axis of the knife should be in the line of puncture and counter-puncture; it is not advisable to direct the knife more vertically to the surface at the place of puncture, because, the puncture being intended to introduce the knife into the anterior chamber at its very angle, there is no margin of safety for the iris, which would become at once engaged by the point of the knife when it penetrated the anterior chamber if the knife were directed towards the centre of the eye. The introduction of the knife with its blade in the 60° plane has three advantages which cause the incision to be much easier of execution and less liable to undesirable com-

plications than is the case when the blade is introduced in the corneo-scleral plane as commonly practised. These advantages are:

1. The back of the knife is towards the iris and it is possible for the iris to come in contact with the knife without incurring any damage: the point alone threatens to become entangled in the iris and has to be watched. With the plane of the knife in the equatorial plane it is very easy for the iris to get caught by the sharp edge of the knife should any pressure be put upon the eye by the fixation forceps. And in eyes with large bulging lenses and shallow anterior chambers it requires skill and care to prevent this accident from occurring. With the back of the blade towards the iris matters are made much easier.

2. The knife enters more easily in this plane than in the equatorial. It was first pointed out to me by Major Smith of Jullunder that the knife would enter more easily if slightly rotated out of the equatorial plane. He has had great experience with blunt knives, and it is when the knife is not quite up to the mark that the shade of difference becomes apparent. It will be found that the same pressure which fails to cause penetration when the blade is equatorial will cause penetration when the blade is slightly rotated out of the equatorial plane. At least that is my impression. I surmise that it must be due to the architecture of the corneal layers. One can imagine that when the blade is in the equatorial plane it wedges its way between parallel equatorial layers of fibres, and acting more like a wedge than a knife it meets with more resistance than it does when the edge of the blade is turned a little forwards so as to sever these fibres instead of wedging them apart.

3. The third advantage of the 60° plane is that the knife is more easily guided into the anterior chamber at the correct spot when held in this plane. It enters at once in the desired direction. Whereas when held in the corneo-scleral plane there is a tendency to split the layers of the cornea so that penetration occurs much nearer the vertical meridian than was intended. This means too small an exit for the lens and a bungled operation. It can be avoided of course by skill. But it adds one more difficulty to the operation, and a serious

one to the unskilled. Likewise it is easier to make the desired counter-puncture when the knife is in the 60° plane. When held equatorially the unskilled operator often cannot make the knife come out at the proper place, especially if the knife be rather thin in the blade, as it bends to burrow between the layers of the sclera. The certainty with which a correct puncture and counter-puncture can be made when the blade is held in the plane LQ will appeal to all beginners.

The knife, then, being held in the correct plane and axis, is introduced well back in the sclera so that the point will enter the anterior chamber just in front of the root of the iris, see Fig. 8. The points of entrance and exit will be in a line 2½*mm* distant from and parallel to the horizontal meridian.

Having got the knife into the anterior chamber it has now to be pushed across to the counter-puncture. The back of it is almost in contact with the iris. If the anterior chamber be deep and the iris flat, all that is necessary is to push the knife straight across. But often the iris will be bulging forward, lying on a swollen lens. The axis of the knife must then be altered and the point directed slightly forward towards the posterior surface of the cornea. When the point has passed in the vertical meridian, the opposite motion is given to the axis of the knife and the point sinks again towards the site of counter-puncture. The back of the blade may now press upon the iris and thrust it and the lens a little back, but no harm whatever ensues, as the iris does not become entangled. The counter-puncture is made deep in the angle of the anterior chamber, and then the knife continues onwards. But immediately the point has pierced the sclera pressure is applied so that the edge cuts out in the plane of the knife, that is of LQ. If the knife be sharp and the operator skilful, it is easy to complete the incision before the heel of the blade reaches the puncture. The result is the cleanest possibly cut incision; an incision hardly visible and giving beautiful coaptation of the margins of the wound. But if the incision is not completed during the forward thrust it is completed on the backward one, and if the reversal of the motion be done properly, the incision will be practically as clean-cut as in the first case. Sawing movements are un-

necessary and should not be indulged in. They leave an irregular and ragged wound which does not heal as well as the clean-cut wound. And in this situation, so near the pupil, this is important.

The completion of this incision after having made the counter-puncture is easier of execution than in the case of corneo-scleral or other flaps. Besides being shorter and thus easier to do with one thrust of the knife, it has another advantage. In sunken eyes or eyes with a sclerosed and contracted conjunctiva, or where the eye is set very close to the nose, it is difficult to thrust the knife far towards the hilt on account of its impinging on the eyelid, caruncle, or nose. This difficulty is much more marked when making the corneo-scleral incision. Certainly there is an Art, which may be acquired, which consists in supporting the eye on the flat of the knife and raising it from its socket at the same time rotating it outwards, whereby the point may be cleared and the corneo-scleral incision completed in the forward and backward thrust. The manipulation, however, is only one for the expert, as four motions are being performed at the same time, all in harmony, viz.: the thrusting, the cutting, the lifting out of the socket on the flat of the knife, and the outward rotating of the eye; the two former making the incision and the two latter serving to clear the knife. But with the radial incision the direction of the cutting itself is such that the force applied tends to lift the eye forwards out of its socket, and it is easy by depressing the handle of the knife to rotate the eye a little outwards and thus give clearance to the point without much danger of disturbing the plane of the incision or of making it irregular.

By pulling the eye well down the radial incision may be made by cutting almost directly forwards away from the patient, which makes the thing a very simple matter indeed compared to the execution of a corneo-scleral flap in a deeply sunken eye with a sclerosed conjunctiva. It is an undoubted fact that the easier an operation can be made as regards its execution, the better it will be done, whether by an expert or by a tyro; and the better in general will be the result. The radial incision tends to avoid operative complications; its simplicity is not the least of its merits; and whilst the theory

as I have endeavored to expound it may appear to some people to be complicated, they may rest assured that its practical application is easy; and that the eye and hand can be readily trained to execute what theory demands.

AN ORIGINAL AND ABSOLUTELY RELIABLE SUTURE FOR TUCKING OR SHORTENING AN OCULAR MUSCLE.

By Dr. G. A. SUFFA, Boston, Mass.

(With six figures on Text-Plates XIV.–XVII.)

AN extensive experience in operations for the correction of muscular errors has convinced the writer of this paper that these irregularities are best corrected by such an operation as will strengthen the weak muscle, without disturbing its tendinous attachment. If a tenotomy of the opposing muscle is necessary it should be limited to the smallest degree.

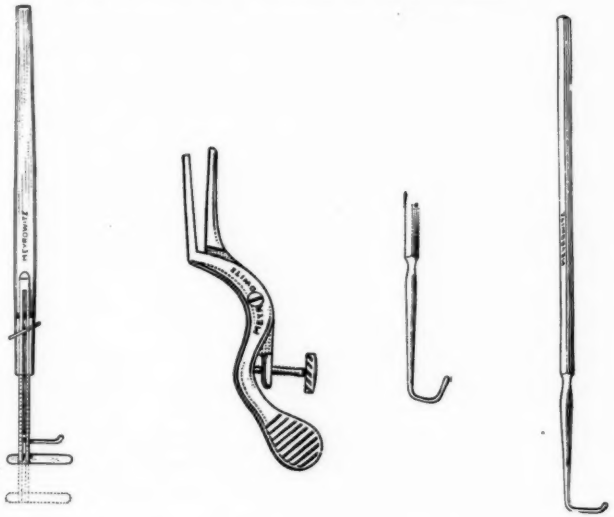
The absolute lack of any definite rule as to the amount of adjustment to be made in a given degree of muscular error has led the author to devise the following operation and stitch, which in his judgment enables him to obtain a much more accurate adjustment than has heretofore been possible.

The first step to bring about this result must necessarily be a stitch that can be accurately placed, and depended upon to hold the muscle in place, without a possibility of its slipping during the healing process, and one that can be removed without disturbing the tucked or operated portion of the muscle. The following stitch fulfils these requirements, and the writer feels confident that in the working out of this stitch he has solved this first essential—absolute accuracy and reliability of adjustment in the problem of establishing muscular equilibrium.

METHOD OF OPERATION.

After the eye has been prepared for operation, cocain and adrenalin used to prevent bleeding, and a semicircular flap

ILLUSTRATING DR. SUFFA'S ARTICLE ON "AN ORIGINAL AND ABSOLUTELY RELIABLE SUTURE FOR TUCKING OR SHORTENING AN OCULAR MUSCLE."



My. Mu. c. Re. h Pl. h.

FIG. 1.

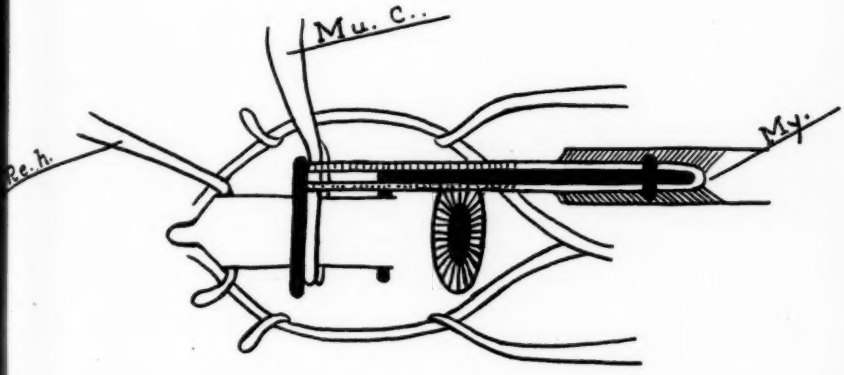


FIG. 2.

of conjunctiva laid back exposing Tenon's capsule and the muscle, a plain tenotomy hook (Fig. 1, P. h.) is passed beneath the muscle close to its attachment to the globe. Tenon's capsule is cut along both borders of the muscle so as to free it thoroughly. A specially bent hook called the retraction hook (Fig. 1, R. h.) is passed under the muscle, and the conjunctival flap is pushed and held back while the muscle is slightly raised. This retraction hook remains in place and by its own weight retracts the conjunctival flap and exposes the muscle (Fig. 2, Re. h.). The common tenotomy hook should be removed and replaced by the myometer (Fig. 1, My.) fitted with an adjustable graduated scale set at the number of millimetres that the muscle is to be shortened; extreme care should be used to hold this myometer well into the angle formed by the union of the tendon and the sclera (Fig. 2, My.) so that the muscle clamp (Fig. 1, Mu. c.) will be fastened to the muscle exactly parallel to its tendinous attachment[1] (Fig. 2, Mu. c.). After the muscle clamp is in place (Fig. 3, Mu. c.) the scale of the myometer can be removed and the hook portion be left in place, or the whole instrument may be removed and the plain tenotomy hook inserted (Fig. 3, Pl. h.).

The stitch is placed as follows: The centre of a No. 6 silk suture, with a curved needle at each end of the suture, is laid across the muscle between the muscle clamp and the retraction hook, the lower needle being held by an assistant. The upper needle in a needle holder is passed beneath the upper border of the muscle, through the muscle close to the clamp, between it and the cross thread, including one fourth of the width of the muscle, and the thread pulled through to the centre of the suture. The needle is then passed over the cross thread (Fig. 3, cr. th.) and through the muscle from above inward in the same relative position, *i. e.*, one quarter way from the edge of the muscle, close to the cross thread, between it and the retraction hook, and the suture drawn taut, forming loop No. 1 (Fig. 3, L. 1). Then the needle and thread are passed underneath the muscle clamp, under

[1] The muscle clamp is best inserted from above when the internal rectus is being shortened.

the tenotomy hook and through the tendon, close to the sclera, still in the same relative position, *i. e.*, one fourth the width of the muscle (Fig. 3, X). The lower end of the suture is placed in the same manner. The needle is passed from beneath outward, close to the muscle clamp, between the clamp and the cross thread, and the suture drawn sufficiently taut to take up all slack in the cross thread. Then the needle is passed over the cross thread, down through the muscle from without inward, drawing the suture taut and forming loop No. 2 (Fig. 3, L. 2), then under the muscle clamp and tenotomy hook and through the tendon at the lower border of the muscle in the same relative position, one fourth the width of the muscle (Fig. 3, Y). The ends of the suture are cut of sufficient length to tie, the muscle clamp and retraction hook are removed, and the suture is tied while the tenotomy hook is being raised by the assistant,[1] thus forming the tuck in the muscle (Fig. 4). The tenotomy hook is removed and the conjunctival flap stitched in place with two lateral sutures, allowing the ends of the suture holding the muscle in place to protrude between the two conjunctival sutures and beyond the returned conjunctival flap (Fig. 5) so as to prevent healing of the conjunctiva at this point until this suture has been removed, about seven days after the operation. In removing the suture it is best to use adrenalin with the cocain as the conjunctiva is still usually considerably congested and bleeds under manipulation, thus obscuring the knot of the suture. Care should be taken in locating the knot, which is hidden by the swollen conjunctiva, and in cutting the suture on one side of the knot only, otherwise the suture cannot be removed.

The dotted line, Fig. 3, indicates the suture under the muscle. Arrows point where the needle is passed in beginning the suture above and below. Fig. 6 shows the various steps in placing the suture.

Removal of the suture is best accomplished by picking up one end and drawing it from you as well as outward. The conjunctival sutures may be removed by the fourth day.

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[1] The tenotomy hook may be removed before the suture is tied, as the muscle tucks just as readily without assistance from the hook.

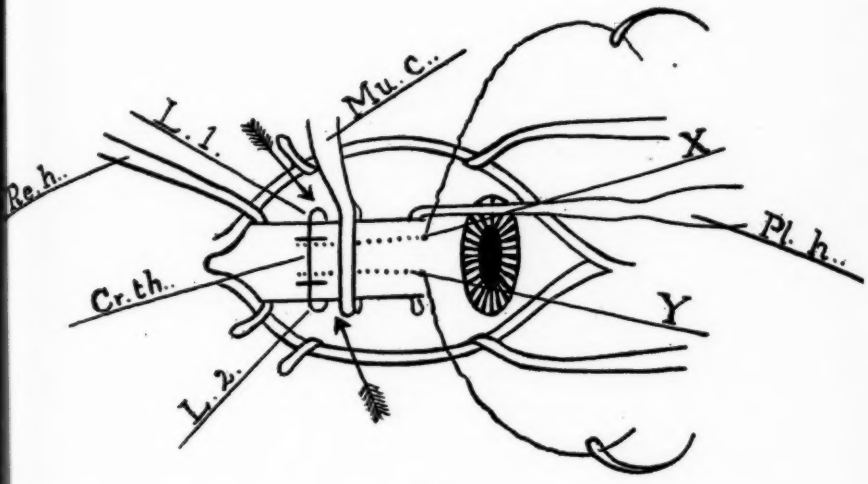


FIG. 3.

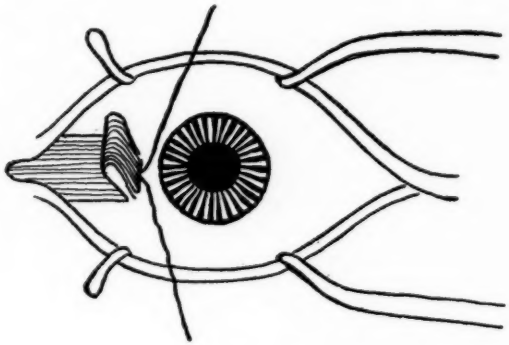


FIG. 4.

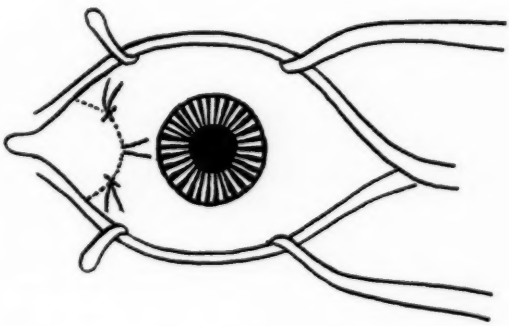


FIG. 5.

The operation requires general anæsthesia, but the muscle suture is readily removed under cocain.

As in all tucking operations, there is an unsightly bunching of the tissues. To avoid this the tuck can be disposed of by cutting it close to the loops of the suture, and the section of muscle thus freed at one end, neatly imposed upon the portion not included in the tuck, or the tuck may be resected, doing away with it entirely. Further investigation will decide which is the better course to pursue.

Both eyes should be bandaged for five days, and the operated one until the suture holding the muscle is removed. Flushing of the eye is not necessary unless secretion requires it, but the lashes should be thoroughly cleansed daily and fresh dressings applied. Sterile gauze pads fastened by adhesive strips are suitable.

Reaction is usually moderate.

The writer realizes fully that he is dealing with a very difficult problem, one that will require many carefully observed operations, covering emmetropic, hypermetropic, and myopic eyes, before a definite rule can be formulated to fit these varying conditions; but feels confident that ultimately this will be accomplished by having successfully solved the first requirement—a reliable stitch that can be accurately placed.

Theoretically, an emmetropic eye would require one millimetre of adjustment for eight degrees of muscular error. Actually, judging from eight operations for exophoria or divergence of high degree, about one millimetre of adjustment will be required for four degrees of error; evidently there is considerable stretching of the operated muscle, which at least partly takes place at the time of operation, but which continues for some time after union has taken place, thus making it necessary to carefully tenotomize the external rectus of the same eye. The writer has not fully determined when the tenotomy should be done, whether before, after, or at the time of the operation.

In the one case of convergent strabismus of fifteen degrees operated upon it has not been necessary to tenotomize the internal rectus, the adjustment remaining permanent after nine months.

Just how large a degree should be done on one eye in high degrees, and many other details of this intricate problem, remains to be determined through actual experience covering all forms of muscular combined with all forms of refractive errors.

I place before the profession this new stitch and method of operating, at this time, feeling that it will be more welcome with many details unsolved than if withheld until these details have been worked out alone, and in the hope that it may be adopted and tried in a sufficient number of cases to enable us to formulate more quickly the exact measurements of the amount of correction needed. It is only in this way,—by carefully measured and recorded operative experience,—in my judgment, that we shall solve these difficult problems in establishing muscular equilibrium.

Advantages of the operation:

1st. Accurate measurement of the amount of adjustment to be made.

2d. Absolute reliability in holding the muscle where placed.

3d. Suture properly placed, avoiding torsion.

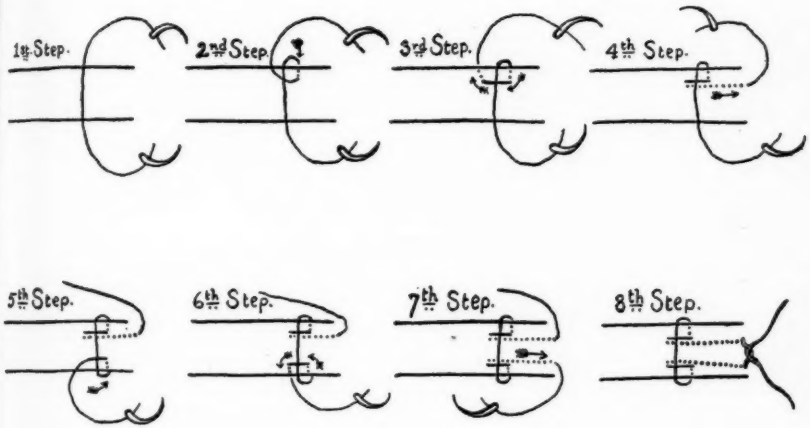
4th. A single removable silk suture, giving firm union.

5th. Simplicity of operation, the muscle remaining in its original position until suture is tied.

6th. The ability to correct large errors without disturbing the primary tendinous attachment.

Figure 1 is a cut of the instruments prepared by E. B. Meyrowitz, 104 East 23rd Street, New York City, where the set may be obtained.

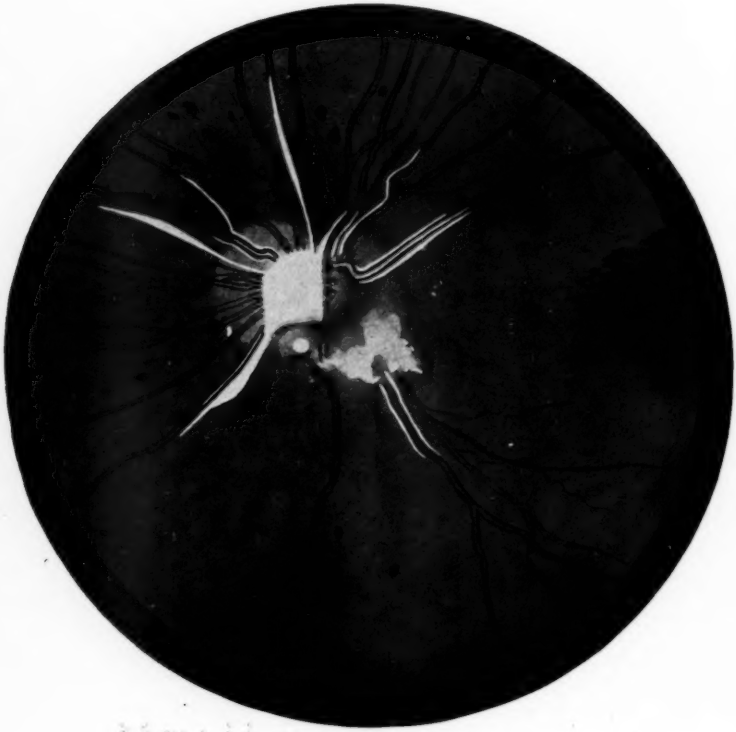
The author has in preparation a supplementary article which describes an original method: First, for accurately measuring and recording the location and extent of the tendinous attachment of an eye muscle; second, for accurately measuring the corrective displacement made in tenotomy; and third, for fixing the muscle securely in its new position until healing is complete.



Dotted lines indicate suture under muscle.

FIG. 6.

ILLUSTRATING DR. HANSELL'S ARTICLE ON "A CONGENITAL CONNECTIVE-TISSUE FORMATION IN THE VITREOUS, PROBABLY ARISING FROM THE OPTIC NERVE."



A CONGENITAL CONNECTIVE-TISSUE FORMATION IN THE VITREOUS, PROBABLY ARISING FROM THE OPTIC NERVE.[1]

By Dr. HOWARD F. HANSELL, Philadelphia, Pa.

(*With one illustration on Text-Plate XVIII.*)

The parents believe that the left eye of their daughter, 16 years of age, has been practically blind since her first year, when she fell on the street, striking her face on the curb and injuring the left supraorbital region. The left eye, at present, is apparently equal in size to the right eye and presents no external abnormalities except that it is divergent. Vision = counting fingers at one foot. The right eye is normal in every respect and vision = $\frac{20}{20}$. Both pupils react to light and convergence but the left has a diameter 1*mm* larger than the right under all conditions of illumination.

The media of the left are clear. At the base of the globe and overlying the optic disk, slightly swinging laterally with the movements of the ball, is a mass of white material, part of it resembling the sclera in its whiteness and the remainder less brilliantly white and vascular. Running out from each side near the top of the mass are white bands of fibrous tissue, accompanying vessels and independent of them, apparently several millimetres long, which disappear in the retina. On the summit lies the non-vascular section, quadrangular in shape, level, and reflecting the light of the mirror almost as brilliantly as metal. The growth, which conceals most of the nerve head, is elevated about 4D. above the fundus, its anterior extremity projecting forward into the vitreous, and it is attached posteriorly to the sheath of the optic nerve. The origin of the vessels on the vascular portion of the mass could not be determined. They are numerous, of good size, and fixed, and presumably

[1] Read before the Section on Ophthalmology, College of Physicians of Philadelphia, November 19, 1908.

are given off from the vessels of the optic nerve. Toward the lower periphery of the fundus are several pigment spots resembling old choroiditis.

The appearances of this case do not correspond to any of the descriptions of Bock of that rare condition, coloboma of the optic nerve, or the more common one of uveal coloboma, or of the characteristic and well-known signs of rupture of the choroid due to the traumatism received in early life. I believe it is a congenital growth in the vitreous springing from the optic-nerve sheath and vascularized by fine branches from the vessels of the disk. It has some points in common with the case of congenital anomaly in the vitreous chamber described by Kipp (*Trans. Am. Oph. Soc.*, 1904), which he thinks should be "regarded as the persistence and condensation of the connective tissue surrounding the fœtal artery in the vitreous body." In Harlan's case of extensive vascular growth in the vitreous (*Trans. Am. Oph. Soc.*, 1889), the vascular network in the vitreous was supposed to be the result of large retinal hemorrhages and was not suggestive of congenital origin. In the *Transactions* of the same Society, 1888, Randall illustrates three cases of congenital outgrowth of dense white tissue upon the disk which, while not identical with my case, so nearly resemble it that I think they belong to the same class. The main point of difference lies in the vascularity. No vessel formation is described in any of Randall's cases.

THE FORMATION OF PUPILLARY MEMBRANES AFTER CATARACT EXTRACTION.[1]

By Dr. EDGAR S. THOMSON.

MEMBRANOUS cataract occurring after cataract extraction is usually composed of the posterior capsule as a base, with the remains of plastic inflammation superimposed. It reaches approximately its final condition in from four to six weeks after the original extraction, although this depends very greatly upon the amount of soft lens matter present, the amount of iritic reaction, etc.

In the ordinary case of cataract extraction, the anterior capsule is opened by the cystotomy and rolled outward and the lens cortex is largely absorbed, leaving only a small pocket of lens fibres enclosed between the layers of the capsule at the periphery, and the pupil filled by the perfectly transparent posterior capsule. In other cases, the products of inflammation, extending over the partially absorbed cortex of the lens, unite with it to form a dense connective-tissue membrane, interposing an effectual bar to vision. Between these two conditions we have, of course, every imaginable variation and degree of membrane formation.

In the most favorable cases, where the cortex is largely removed at the time of the operation, or where it is absorbed without a definite secondary iritis, we have a membrane formed of transparent posterior capsule with a circular rim of cortical fibres at the lens equator. This rim, sometimes called Soemmering's crystalline swelling, is composed of lens fibres which are enclosed by the apposition of the remains of the anterior capsule and the posterior capsule and are there-

[1] Read before the Section on Ophthalmology of the N. Y. Academy of Medicine, Jan. 18, 1909.

fore protected from the solvent action of the aqueous. They are not absorbed, and indeed invariably increase in volume by proliferation and, in some instances, infiltration with leucocytes and fibroblasts.

After a time, the whole mass undergoes a series of retrogressive changes, resulting in connective-tissue formation, contraction, and more or less disturbance of the position of the membrane,—depending on the amount of lens substance in this swelling, the amount of fibroblasts present, and the extent of the swelling around the circumference of the capsule.

In these conditions we may have traction upon the ciliary body through the zonule in a single point or in its whole extent, and apparently spontaneous attacks of low-grade cyclitis will supervene, in spite of the fact that we have a clear pupil and good vision, for it must always be borne in mind that the ring lies behind the iris and we have no way of observing the progress of these changes. The behavior of the capsule in the pupil is only of limited value in guiding us as to the extent of these changes. If we consider for a moment the mechanical principles involved, we can easily see that tightening of the capsule may take place or that it may be relaxed through a symmetrical narrowing of the diameter of the ring. A stretching of the capsule in a definite direction might be an indication of value, but where we are dealing with a membrane composed of transparent capsule the difficulty of observing this feature is apparent. It is safe to assume, however, that in the vast majority of cases of cataract extraction by the ordinary method a considerable amount of cortical matter is left at the equator. This has been frequently observed by those accustomed to histological examination of these eyes, but few observations seem to have been made on the clinical importance of the condition. This is partly due to the fact that the retrogressive changes take place slowly, and we are not able to follow their course, as our patients, being old, do not live long enough for complications to ensue. It is, nevertheless, a very common thing to find contraction-bands in old membranes in this situation, when making examination of enucleated eyes.

I should hesitate very much, however, to attempt an estimation of the frequency of this especial set of conditions,

that is, post-iridial contraction-bands with a clear pupillary membrane. Probably it does not occur very frequently, but it is none the less important when it does occur, and the point I wish especially to bring out is that a clear pupil with good vision does not necessarily preclude the existence of a mechanical irritation in accounting for the apparently spontaneous attacks of uveal irritation which we sometimes see after cataract extraction.

It would seem that the mere fact that an eye has been operated upon would be insufficient to account for attacks of inflammation where no previous tendency has ever existed, and that there must certainly be contraction-bands in many of these cases where they are least suspected. Judging from their frequency in histological examinations, and not merely in badly inflamed eyes, but in all classes of cases, contraction-bands frequently exist without causing any trouble.

Undoubtedly the principles of resistance apply here in determining why one patient will have attacks when another will not, but the general principle that contraction-bands pulling on the ciliary body are able to determine attacks of inflammation or even of glaucoma, has been well recognized though perhaps not sufficiently emphasized. From the visual standpoint, the contraction of a transparent membrane seems not to have any effect, but if the membrane is relaxed and wrinkled the reflections of the light rays from its surface and the irregular refraction of the rays will necessitate the formation of a new pupil, which is usually not a difficult task.

There is no question but that it would be very desirable to remove all of the equatorial cortex of the lens, and the best way of furthering this end is to remove as much as possible of the anterior capsule. It is my own custom to make a very wide crucial incision with the cystotome, carrying the incisions as far out towards the equator as possible, and relying on the well-known tendency of the lens capsule to curl outwards, for obtaining the greatest possible exposure of the interior to the action of the aqueous.

From theoretical grounds, I disapprove of tearing off a piece of capsule with the forceps, as has been practised by some operators, for I do not see how a very large amount of capsule can be removed in this way. Neither do I believe in

a peripheral capsulotomy, which leaves the anterior capsule stretched across the pupil. This latter procedure seems to me to give the most favorable conditions for the development of contraction-bands. The washing out of the capsule after the extraction is entirely in the right line of action, but I do not believe it is always possible to wash out every particle of lens matter, as we would like to do.

In a larger class of cases than the preceding, we have, besides these conditions at the equator, a certain amount of connective-tissue formation across the pupil, which covers the remaining cortex and forms with the posterior capsule the kind of secondary membrane with which we are all familiar. The important element here is the connective tissue which originates from the iris-fibroblasts, and this, binding down the unabsorbed cortical material and protecting it from the action of the aqueous, is the real cause of the opacity, which is the denser the more fibroblasts are deposited.

Many writers on this subject speak of thickening of the capsule, which certainly is an unfortunate word to use, for there is not the slightest evidence that the capsule undergoes any change in itself. It is well known to be highly resistant to the action of water, acids, alcohol, etc., after removal from the eye, and even in very badly disorganized eyes the capsule is frequently found clear and unchanged. It is even capable of a good deal of resistance to purulent processes within the eye. The formation of the fibrous tissue, then, is the thing to be avoided, and this is only done by limiting the amount of hyperæmia as much as possible, by the early and judicious use of ice, atropin, etc., during the after-treatment of the extraction. As a rule, the amount of fibrous tissue formed is proportional to the amount of secondary iritis, but even where there is little hyperæmia, if there be a large amount of cortex to be absorbed there will be some invasion by fibroblasts and consequent deposit, and the longer such a membrane remains, the further the process of connective-tissue organization goes on, and the tougher and more resistant are such membranes to operation.

I have seen it stated that absorption of the cortical fibres goes on more rapidly in an eye with a certain amount of ciliary hyperæmia than in a perfectly quiet eye, but this I

cannot believe to be the case. Any redness whatever leads to a certain tendency to connective-tissue formation, if nothing more, and my best results have always been in eyes where the absorption of the cortical material was attended by very little redness. For this reason the constant use of ice while the cortex is undergoing absorption is strongly to be recommended.

Aside from the interference with vision, we have in this class of membranes the very important element of traction on the ciliary body, which may come on in a surprisingly short period after the extraction—four to six weeks—depending on the amount of contraction, the size of the bands, and the reactive tendencies of the ciliary body.

Adhesion of the iris to the bands I regard as of very little importance. The iris is elastic and freely movable, and moreover the tissue in patients of advanced years, once having stretched, is very apt to become atrophic, and does not resist the contraction of the membranes as does the less elastic tissue of the ciliary body. The ciliary body is much more fixed and much more irritable, and is apt to become hyperæmic, to break out into low-grade attacks of plastic inflammation, or even to set up a secondary glaucoma.

While the diagnosis of equatorial bands may be difficult, there can be no difficulty in the present class of cases where the whitish strands of connective tissue may be plainly seen stretching across the pupil, and where we can see the lines of traction distinctly. It is sometimes difficult, however, to judge correctly of the toughness of the membrane and amount of the resistance which any given case will offer to division by the knife needle or the small Graefe knife. Not infrequently I have been surprised to find an apparently frail-looking band so tough that the knife would hardly go through it without undue violence, and it seems necessary in forming one's judgment to take into consideration the original formation of the membrane, the amount of iritis following the extraction, the amount of cortical material left to be absorbed, the length of time since the extraction, and all the other factors which make for well-developed connective tissue.

If one uses the de Wecker scissors, the clinical point becomes

less important, as the membrane can be freely divided in any event. This operation has the further advantage of allowing a very free division of the membrane with no more traumatism than would accompany a small cut, and a free division is highly desirable, as insuring the cessation of traction on the ciliary body in a manner that a small central cut with a knife might not accomplish.

Recently the effort has been revived to avoid the whole question of secondary membrane by removal of the lens in its capsule, and it cannot be doubted that in many cases, perhaps the vast majority, the operation once successfully accomplished, membrane formation is precluded for years to come.

This suggests a very interesting question as to whether or not we may ever expect to find a pupillary membrane after the removal of the lens in capsule. A similar question arises in cases with a small central opening in the membrane left by a needling operation where the vitreous is directly exposed to the action of the aqueous. Cases with marked attacks of iritis are naturally to be excluded in the present connection, as every one knows how easily membranes are formed here from very slight attacks of inflammation. These membranes are composed of plastic exudations upon the surface of the vitreous, and need only be mentioned in passing.

It is possible, however, to have a gauzy membrane formed after the lens and capsule have been removed, even where there have been no perceptible iritic attacks. I have observed a few such cases clinically, and have frequently seen delicate membranes in histological sections which I considered to be identical with the former. They are formed by thickening and condensation of the external layers of the vitreous, and seem to be caused by the mechanical sagging of the vitreous forward, without any restraining membrane to hold it up. There is usually no appearance of plastic exudation upon the membranes, and no appearance of new connective-tissue formation. They are composed of delicate strands of fibrous tissue resembling closely the normal hyaloid. Where the lens has been extracted in capsule, it is difficult to say, on account of the intimate association of the hyaloid with the posterior capsule, whether these membranes are vitreous

fibres simply or hyaloid which has undergone some thickening. Where a needling has been done, however, and a small opening made in the capsular membrane, there is little doubt that the hyaloid, as such, takes little part in the recurrent gauzy membrane which is so frequently seen. In the absence of inflammatory conditions these membranes must be viewed as fibrous strands of the vitreous, and they may occur in any case after the lapse of a sufficient interval of time.

Their treatment is not always a simple problem, as they are extremely friable and are difficult to remove en masse, and though the instrument tears through them with ease there are times when the results of operation are disappointing from the fact that the attached fragments so readily fall back into their former position. Probably a very free division in several directions, without going too deeply into the vitreous body, gives the best results, but there is no way to be sure that the membrane will not re-form, although in the absence of inflammatory conditions the recurrence is always a slow process.

OPERATIVE TREATMENT OF SEPARATION OF THE RETINA. REPORTS OF CASES TREATED BY SCLERAL PUNCTURE.[1]

By Dr. EDWARD KEITH ELLIS,

ASSISTANT OPHTHALMIC SURGEON, CARNEY HOSPITAL; CLINICAL ASSISTANT, MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY, BOSTON, MASS.

OF recent years many methods of procedure have been advocated by ophthalmologists for the treatment of separation of the retina. Some have given promise of producing good results, but have not withstood the test when put into practise to any extent, while others have proven to be efficacious in many cases in the hands of different men.

Many cases have been reported as cured within a short time after their discharge; in fact it is very often the case that absolute cures are claimed within a month or so from the time treatment ceased, when if the cases should be followed it would very often be found that the retina had again become separated, and the original state of affairs again obtained.

With nearly every form of treatment which embraces complete rest in bed, a replacement, or at least a marked decrease in the amount of separation can be accomplished, so that immediately on ceasing treatment the conditions look very promising; but further observation of the patient is very apt to show the separation again returning, and our reports of cures premature.

Surgical intervention in the treatment of separation of the retina was first proposed by Sichel in 1859. He advocated

[1] Read at a meeting of the New England Ophthalmological Society, February 9, 1909.

the puncture of the sclera and chorioid over the site of the separation, and used a broad needle with a sharp point, but with dull edges. This was passed into the subretinal space, parallel with the ocular muscles, in order to avoid injuring the chorioidal vessels any more than necessary, but not so deeply as to penetrate the retina, for fear of further displacement. The instrument was then given a quarter turn to evacuate the fluid. A bandage was then applied and the patient placed on his back for ten days.

Von Graefe recommended discission of the retina.

Drainage by a fine gold wire passed through the sclera and chorioid was employed by Grizon and de Wecker.

Stitching of the retina to the chorioid with fine catgut was advocated by Galezowski.

Bowman instituted dislaceration of the retina with two needles.

Iridectomy was done by Galezowski and others, and good results were reported.

Injections of tincture of iodin into the subretinal space for the purpose of producing a plastic chorio-retinitis, anticipating that the resulting inflammation would unite the two coats and thus obliterate the offending space, were recommended and tried by Schoeler, Galezowski, and Gelpke. Reports of cures appeared, but the method was disastrous in the hands of others, in one case being followed by meningitis and death.

Injections of air into the vitreous to increase the tension of the eye and press the retina back against the chorioid have been tried.

Dor touched the sclera lightly over the site of the separation with a small cautery, and injected a 10% solution of salt under the conjunctiva; following which the patient was placed in bed.

Puncture of the sclera with the galvano-cautery has been employed by Galezowski and Abadie.

Walker and Grossman injected normal salt solution into the vitreous after evacuation of the subretinal fluid.

Injections of a 3.5% solution of gelatin in a physiologic salt solution between the sclera and the capsule of Tenon has been used by de Wecker.

Transfixion of the eyeball and cutting of the vitreous bands have been advocated by Deutschmann and Jaencke. Deutschmann used a double-edged narrow knife passing the instrument through the coats of the eye, dividing whatever bands lie in the vitreous, and liberating fluid before and behind the retina. Rabbits' or calves' vitreous, diluted with normal salt solution, was then injected into the vitreous with a hypodermic syringe to press the retina permanently against the chorioid, until the resulting uveitis had established union.

At the present time Deutschmann advocates transfixion of the globe, omitting the sweeping motions of the knife, and emphasizes the importance of repeating the operation as often as is necessary, even up to fifteen times. In desperate cases he still uses injections of the vitreous of the rabbit, starting with a weak solution and gradually increasing, should occasion require. He has lately combined this treatment with cauterization of the sclera, but with no visible advantage.

Electrolysis has been recommended by Gilet de Grandmont, and in 1901 Maraval reported ten cases of its use, in which two were cured and the remainder much benefited. He says the puncture of the needle allows a partial escape of the serous exudate, favors the formation of adhesions, and increases the general ocular nutrition.

A five to five and a half milliampere current controlled by a rheostat is passed for one minute's time. Four days after the use of electrolysis subconjunctival injections of 1–1500 to 1–2000 strengths bichloride of mercury are begun, to maintain the effect of the electrolysis. A bandage is applied, and the patient kept in bed not longer than six weeks. The process must be repeated as often as necessary.

In 1907, Sachs of Vienna stated as his belief that in order to be efficacious, puncture of the sclera should be made in the place where separation usually starts and is most marked; that is, half way between the optic nerve and the ora serrata; these being the two situations where the retina is definitely fixed. Adhesions here between the retina and chorioid would act as a dam and prevent the passage of subretinal fluid forward. His method of operating in such cases is as follows: After lifting the conjunctiva, he fixes a loop suture in the muscle overlying the separation. He then cuts across

the muscle and rotating the eye away from the cut muscle passes a sickle-shaped knife backward on the flat over the greatest convexity of the globe. The point of the instrument is then made to incise the sclera, dividing it in a frontal plane. The fluid then escapes, the divided muscle is reattached, and the conjunctiva is closed with a suture.

This process can be repeated later, dividing other muscles if it seems necessary to puncture in other situations. He reports good results by this method, although at the time of writing none of the cases had been under observation longer than one month after the operation. Diplopia has resulted in one case from cutting the muscle, with hemorrhage into the vitreous in another.

Good results and absolute cures have been reported in cases where subconjunctival injections of dionin have been employed, together with pilocarpin sweats, bandage, rest, and proper general treatment.

Cures have also been reported where surgical interference of any kind was omitted, and the treatment consisted simply of subconjunctival injections of salt solution, in strength ranging from 6% to 25%, together with diaphoresis and rest in bed.

With this review of the many methods advocated by trustworthy observers during the past fifty years it is evident that superiority can be fixed upon no one procedure, since what serves the purpose admirably in the hands of one operator fails in those of another.

It has seemed to me that the method which gives the best results is simple puncture of the sclera and retina, evacuating the subretinal fluid together with some vitreous, placing the patient flat in bed with both eyes bandaged for a period of at least ten days, and if deemed advisable employing daily subconjunctival injections of salt solution. The solution may be started at 6% and increased up to 20% or 25%.

The two cases here reported show the results obtained by the above procedure. In several other cases of separated retina the method was used, but without success, in most instances the patient being unwilling to undergo the tedious after-treatment.

The first case is that of J. W. T., 27 years old, a machinist by trade. There was no family history of eye trouble. He had worn weak myopic glasses at times for the past twelve years. While playing basket-ball some five months ago he received a blow in the right eye. Nothing unusual was noticed at the time except the customary "black eye." About one month ago he noticed that the vision of the right eye was poor, and for the past two weeks it had steadily grown worse. Vision at this time was ability to count fingers at five feet with the right eye, and $\frac{20}{30}$ with the left. He was advised to enter the Massachusetts Charitable Eye and Ear Infirmary, and was admitted to that institution May 5, 1906, on the service of Dr. F. E. Cheney.

Examination of the right eye at that time showed a separation of the retina downward and outward, not readily seen except by following the course of the blood-vessels. Upon leaving the disc the vessels were blurred, and were best seen at the height of the separation below with a plus 6 sphere, direct method. No degeneration or difference in color of the retina was noticed, and in all other situations the retina was in normal position. Several fine white lines extending from the macula region directly outward were seen, due probably to minute wrinkles in the separated retina. The left eye was normal.

The patient was put to bed with the eyes bandaged and given subcutaneous injections of pilocarpine grs. $\frac{1}{8}$ for three nights successively, with a rest for three nights. This procedure was repeated. At the same time subconjunctival injections of a 5% salt solution were commenced twice daily. The eye was examined on the 16th but there was no improvement in the condition.

On the 19th scleral puncture was performed. After having cut the conjunctiva over the separation a narrow cataract knife was passed through the sclera into the subretinal space, and a little fluid was allowed to escape. The conjunctiva was closed with two silk sutures, and a double bandage applied, the patient being kept in bed until the 31st. Examination in the dark room at this time showed some improvement, but not a complete replacement The patient was put to bed again and subconjunctival injections were renewed and continued until June 15th. At this date he was discharged with a vision of $\frac{20}{100}$. The condition of the retina was the same as at the last examination.

He was re-admitted to the hospital July 20, 1906. The vision now was $\frac{14}{200}$. Fundus examination showed the same condition of affairs as at the first admission, except that the separation was not so marked. The operation

was repeated as described above. August 4th subconjunctival injections of a 10% salt solution were commenced. August 13th 20% salt solution injections were begun. August 19th the patient was up and dressed with a vision of $\frac{8}{10}$. This vision held until August 31st, and at this time with a minus .50 sphere vision improved to $\frac{8}{8}$ plus. The patient was discharged. Vision remained as above for about four weeks, when it again became poor, and on October 8, 1906 he was re-admitted to the hospital for the third puncture. This was done in the same manner as before. The after-treatment remained the same as formerly except that the salt-solution injections were given only once a day, starting with a 5% and increasing to a 20% solution.

Examination of the eye November 2d showed no improvement of the condition, and on November 13th the operation was again performed; after-treatment as above described. The patient was discharged November 28th. Vision of the right eye was $\frac{20}{100}$; with a minus .75 sphere, $\frac{8}{10}$. Three weeks later the vision was $\frac{8}{10}$; with a minus .75 sphere combined with a minus .75 cylinder axis 180, $\frac{8}{10}$.

Examination of the fundus showed no sign of separation, and none has appeared up to date. The fields immediately after each puncture were normal in size but became contracted in from one to four weeks, until after the fourth operation, when the field resumed its normal size, and it has remained so up to the present time.

I have seen the patient at intervals since the last puncture, and examination of the fundus has revealed nothing abnormal. The place in the retina where the knife penetrated could be distinctly seen at the last visit, evidenced by a line of black pigment.

In this case the patient's confidence and persistence were two valuable assets, and his experience fully illustrates the importance of repeated punctures. I have operated upon several others,—in one case three times,—but in each case the patient became discouraged and did not return for further treatment of this kind.

The second case is that of T. W. K., 32 years old, who came to the ophthalmic out-patient department of the Carney Hospital April 18, 1907, complaining of failing vision in his left eye. This was first noticed about six weeks previous, and he had consulted an "eyesight specialist" who gave him glasses. At first these seemed to

give some relief, but during the past three weeks his vision had steadily failed.

Examination of the fundus showed a separation of the retina extending over nearly the whole lower half, with the greatest separation in the lower outer quadrant, where the ophthalmoscope showed an elevation of about seven dioptres. The retina appeared healthy except for slight cloudiness, due probably to the fluid contained in the subretinal space.

The records of the department do not show the exact vision at this time, but the house surgeon stated that it was about $\frac{10}{200}$.

The patient was put to bed, his eyes bandaged, and subcutaneous injections of pilocarpine grs. $\frac{1}{8}$ were given daily for three days, omitted for three days, and the process repeated.

April 24th about 10 minims of a 5% solution of dionin were injected under the conjunctiva in the lower outer quadrant. This was repeated April 27th and May 8th. Diaphoresis was kept up after the manner explained above until May 17th. At this time examination showed still a very slight separation of the retina. May 20th dionin was again injected, and the next day the fundus being examined showed a replacement of the retina everywhere. The vision at this time was $\frac{5}{10}$, and with a plus .62 sphere combined with a plus .25 cylinder axis 90 came up to $\frac{10}{10}$. He was discharged from the hospital.

August 13, 1907 he returned with the separation again in evidence, it being now about 9 dioptres in height. The sclera was again punctured opposite the site of the greatest separation with a narrow Graefe cataract knife, the subretinal fluid and a slight amount of vitreous allowed to escape, the eye atropinized, a double eye bandage applied, and the patient put to bed for ten days. A 1% solution of atropin was instilled into the eye once a day. Beyond this no further treatment was employed.

August 24th the ophthalmoscope showed a replacement of the retina everywhere, and with a plus .37 sphere combined with a plus .25 cylinder axis 105 the vision came up to $\frac{5}{5}$, and has remained so up to the present time. The visual field has been normal since the patient's discharge from the hospital. There has been no evidence of separation at any time since August 24, 1907. The patient, as in the other case, was cautioned against violent exercise, stooping, or lifting heavy objects, and both have followed this advice faithfully.

It has seemed to me, from the results obtained in these

cases, that this method of procedure offers more chance of cure than simple rest, bandaging, diaphoresis, and subconjunctival injections. Combining these latter with scleral puncture may be of some advantage, but the principal point, it seems to me, is to obliterate the subretinal space if possible, in an endeavor to bring about union of the retina with the chorioid at the site of the separation.

These cases were both of the most favorable kind, it is true, but Deutschmann and others have obtained good results in cases which were far more unfavorable; for instance, in the separations occurring in high myopia.

In conclusion, I believe Deutschmann's advice to repeat the process as often as necessary can hardly be emphasized too strongly.

SCLERAL COLLAPSE DURING CATARACT OPERATION.

By Dr. JUAN SANTOS FERNÁNDEZ, Havana, Cuba.

DR. SIRIEYS has published an article with this title[1] and states that the great majority of authors do not mention this accident or limit themselves only to calling attention to the two cases of Choden and the one of Roux (of Caen), and as we have observed twenty-six cases, of the first ones of which we wrote in 1895[2] and of the last ones in 1902,[3] I will now describe the whole series of observations, taken from the archives by Dr. Francisco M. Fernández, my chief of clinic.

If in the first few cases we had any doubts about the cause producing the ocular hypotony or softness, later on we noticed that cocain was instilled before the operation almost without measure, and thereafter we limited the amount instilled to three drops of a 3% solution, one every ten minutes, and at the utmost a fourth drop just before operating. We have not observed at all the collapse that in one season only was observed in twenty-six cases, and perhaps in a few more that escaped my observation. At first I thought that poorly nourished individuals were predisposed to this accident, but later on we gave no importance to that idea as it occurred also in strong and healthy people.

In physiology it is admitted that just as digitalis increases the intraocular tension, cocain diminishes it; but we also know, and this seems to be contradictory, that cocain predisposes

[1] *La clinique ophtalmologique*, No. 3, 1908. Paris.

[2] *Archivos de la Sociedad de Estudios Clinicos de la Habana*, p. 195, vol. viii.

[3] *Archivos de Oftalmologia Hispano-Americanos*, p. 532, vol. ii.

to glaucoma. In the cases we are going to relate we cannot, of course, put aside personal idiosyncrasy; but the fact of not having observed any other case of this kind since we have taken personal care that the solution of cocain used was to be only 3% strong and the number of drops three or four, gives us the right to suppose the excess of this drug as the only cause.

CASE 1.—Man of sixty-five. Was operated by simple extraction. Right eye. Five drops of 3% cocain solution. Keratotomy and discission without difficulty. When we tried to induce, by pressing first over the lids and then with the spoon, the delivery of the cataract, this sunk on account of the little distension of the sclera; the lips of the corneal wound opened; but the lens did not appear until we pressed with another spoon on the lower part of the sclera. The cataract had the borders stained with pigment. The operation was successful.

CASE 2.—Man of fifty. Simple extraction. Left eye. Discission with the end of the knife. Before the operation there was a slight tremor of the iris. After insistent pressures during which the spoon sunk in the sclera, the lens appeared, but remained detained between the borders of the wound and was delivered after renewed pressure. The pupil became oval after the operation. Quick recovery.

CASE 3.—The same man as Case 2. He was operated on the right eye eight days after. Keratotomy and discission. Pressure in vain; it was necessary to compress with the handle of the fixation forceps in the lower part and with the spoon in the upper. The eye seemed crushed and the lens gradually came out; the patient, meanwhile, experiencing no disagreeable sensations. In each eye there had been instilled four drops of 5% cocain solution. Recovery with the same rapidity as the other eye.

CASE 4.—Man of seventy-five. More than four drops of 3% solution. Right eye. After keratotomy for simple extraction was made, I proceeded to expel the cataract and noticed that the spoon sank in the sclera. Only after repeated pressure was the opaque lens delivered, and afterwards the cortical remains were also delivered. Pupil remained clear. Discharged soon after.

CASE 5.—Woman of fifty. Very thin. Four drops of 3% cocain solution. The difficulty in extracting the cataract made me think it was luxated. Pressure on the eye through the lids first and after with the spoon did not bring it out.. Only after almost crushing it, the opaque

lens appeared followed by a small quantity of vitreous humor. Quick recovery.

CASE 6.—Man of sixty-four. Had many drops of 3% cocain solution instilled in his right eye, without the assistant keeping account. Operated by simple extraction and discission with the knife. Notwithstanding the pressure made over the lids, the cataract did not come out. Not without fearing a vitreous prolapse, we made new pressure and the softness of the eyeball grew very marked before the lens came out, followed by the cortical remains. Discharged cured.

CASE 7.—Man of sixty. Sometime before, he had been operated on the right eye, without having had any signs of hypotony; now after several drops of 3% cocain solution, the cataract did not come out and the intraocular tension was very much lowered. It was necessary to compress through the lids with the fingers above and below, and even then only after new and insistent pressure it came out without vitreous prolapse. The lens was very large, of dark hue and with pigmented edges. Discharged well.

CASE 8.—Man of sixty. Repeated instillations of 3% solution. Simple extraction. The softness of the eye required repeated pressure on it before the cataract came out. After new pressure the cortical remains were also expelled. Favorable result.

CASE 9.—Man of fifty-one. Myope of 4 D. A neurotic individual. Simple extraction. Numerous drops of 3% cocain solution. By pressing through the lids on the eye, the borders of the incision opened but the lens did not come out. After sinking the spoon in the lower part of the sclera, it came out very slowly. Cured and the resulting vision was the best we have seen in any case of this kind.

CASE 10.—Woman of sixty-eight. Very thin but healthy. Right eye. Simple extraction. Three drops of 4% cocain solution, one every ten minutes. After the keratotomy and discission with the knife, I was going to remove the ophthalmostat when I saw the exaggerated depression of the cornea. We waited for fifteen minutes and its convexity was re-established. We made pressure and although the incision opened, the cataract resisted expulsion. It was necessary to press with one spoon on the upper part and with another on the lower to bring it slowly out. After its delivery the corneal depression was again marked and the appearance was that of an empty eye. The patient did not suffer the least disturbance, and twenty minutes after the operation the eye had its normal aspect. Discharged cured.

CASE 11.—Same patient as Case 10. Operated by simple extraction a few minutes after the operation on the

right eye was finished. Five drops of 4% cocain solution. Same corneal depression as in the right eye. In this case we did not wait for the re-establishment of the convexity. Pressure with the fingers and with one spoon was insufficient. We needed two spoons and by pressing with them on the sclera above and below, we brought the lens slowly out. In fifteen or twenty minutes the eye appeared normal. Recovered vision in both eyes.

CASE 12.—Man of thirty-seven. Left eye. Four drops of 4% solution. Simple extraction. Being a docile man the operation was accomplished very easily. After the keratotomy and the discission with the knife and having removed the ophthalmostat, the cataract had a luxated appearance and although I exerted strong pressure with the fingers through the lids, it was necessary to use the spoon, and by pressing with it on the sclera the cataract was brought out. The patient recovered vision.

CASE 13.—Woman of seventy-seven. After instilling a numberless quantity of drops every ten minutes, the simple extraction was performed. At the time of bringing out the cataract it was necessary to press strongly with the spoon on the lower part to complete its exit.

CASE 14.—Same woman as in Case 13. Left eye. Keratotomy and discission. Greater difficulty than the other eye. Exaggerated eye softness. Had an attack of iritis which required a prolonged course of treatment.

CASE 15.—Man of forty-eight. Several drops of 3% solution every ten minutes. Simple extraction. At the time of expelling the cataract by digital pressure we found difficulty on account of the softness of the eye. It was finally brought out by pressing with the spoon on the surface of the sclera. Soon after, the eye recovered its normal aspect. Three years after the operation the patient had perfect vision.

CASE 16.—Man of sixty-three. Several drops of 3% cocain solution, before the extraction was done. It was necessary to exert vigorous pressure with the spoon, that sank in the lower part of the sclera, to bring out the lens and the cortical remains. Discharged well.

CASE 17.—Man of eighty. Simple extraction. More than three drops of 3% cocain solution before the operation. Pressure on the lids was of no avail. It was necessary to use the spoon and only after pressing so hard as almost to bury it in the surface, the lens appeared. Discharged well.

CASE 18.—Woman of sixty-four. Right eye. Several drops of 3% solution. Pupils dilated by atropin. After the discission when the cataract was coming out there was

an excessive degree of hypotony. Only after compressing above on the lid and below with the spoon. which sank in the sclera, the lens came out and after it the cortical remains.

CASE 19.—Man of sixty-four. Left eye. Simple extraction. Several drops of 3% cocain solution. When the extraction was being done, it was necessary to bury the spoon in the lower part of the sclera to help its delivery. Discharged well.

CASE 20.—Man of forty-nine. Sometime before he had iridectomy performed to make the simple extraction later on. Had five drops of 6% solution. We tried vainly, after incising, to expel the lens; and it was necessary to use the spoon to provoke its delivery. Afterwards, the cortical remains came out abundantly. Six days after he was attacked with iritis which proved most difficult to cure.

CASE 21.—Woman of sixty. Had a preliminary iridectomy, as recommended by Jacobsen. After instilling seven drops of 4% solution, the incision was made. We met great difficulty on trying to effect the extraction and pressure exerted on the lids with the fingers was of no avail. It was necessary to use the spoon and to sink it in the sclera and then the lens was expelled; also the cortical remains. The cornea remained depressed for some time. Patient discharged well.

CASE 23.—Man of sixty-eight. After instilling 5 drops of 5% cocain solution extraction was practised and there was noticed marked sinking of the sclera. Pressures over the lids were insufficient and it was necessary to sink the spoon in the surface of the sclera to deliver the opaque lens and some cortical remains. Discharged cured.

CASE 24.—Same man as above operated on the left eye immediately after. Six drops of 4% cocain solution. The scleral collapse was so pronounced that the spoon was buried in the fold formed by the sclera on sinking. By successive pressing, the lens was brought out and a considerable amount of cortical remains. Recovered perfect vision in both eyes.

CASE 25.—Man of fifty-six. Fifth case in the same family which had cataract at mature age. Four drops of 5% cocain solution. As in the last case there was found a very noticeable hypotony and only after sinking the spoon vigorously in the sclera the cataract was delivered slowly. There was no disturbance before or after the operation and now he enjoys, as his brothers, perfect vision.

CASE 26.—Man of sixty. Simple extraction. On trying to provoke the delivery of the cataract, we noticed the extreme softness of the eye. Pressure with the fingers

through the lids, although repeated and vigorous, was unsuccessful; and almost without hope of bringing the lens out, we re-applied the ophthalmostat that had been retired, applied two spoons, one above and the other below the incision, and only after an almost complete crushing of the eye, we saw the lens appear between the borders of the incision and very slowly coming out. A few minutes later the eye recovered its normal aspect and the patient was able to count the fingers Discharged cured. We have not seen him again.

A CASE OF PARALYSIS OF THE INFERIOR OBLIQUE MUSCLE OF THE LEFT EYE.

By Dr. MARTIN COHEN, New York.

(With one figure on Text-Plate XIX.)

C. R., a girl seven and one-half years old, came on Feb. 4, 1909, to the New York Ophthalmic and Aural Institute on account of an apparent inability to see with the right eye, a fact which was discovered by the school inspector in the course of a routine examination. As subjective visual disturbance was not present, it is difficult to determine the duration of the muscular disturbance found on examination.

There is no history of previous illnesses. The patient began to walk when over two years of age. It cannot be determined whether there was also delay in dentition or speech, as the mother was unable to come with the patient. The mother has pulmonary tuberculosis; the other members of the family are well.

Physical Examination: The head is inclined toward the left side. There is some pallor of face. The general physical examination is negative.

Vision of both eyes is $\frac{20}{30}$.

Refraction: hyperopic astigmatism in both eyes 0.75 D., axis 75°. After correction, vision $=\frac{20}{20}$.

Primary deviation of left eye slightly downward and inward. Secondary deviation, upward and outward. There is inability to elevate the left eye.

When the left eye is markedly adducted there is inability to elevate the eyeball. In abduction, the eyeball can be but very slightly raised. No diplopia is now present, nor is there a history of its ever having been present. The pupils are equal and react to light and accommodation. The fundi present a normal appearance.

Isolated paralysis of the inferior oblique muscle is rare. In this case, there may be a slight involvement of the superior

ILLUSTRATING DR. COHEN'S ARTICLE ON "A CASE OF PARALYSIS OF THE INFERIOR OBLIQUE MUSCLE OF THE LEFT EYE."

rectus, as shown by the marked limitation of elevation in abduction.

As there is no history of any infantile affection which might have produced a paralysis of the ocular muscle, it would seem probable that this is a case of developmental muscular defect of congenital origin.

ABSTRACT OF ARTICLES IN VOL. XLIX., GERMAN EDITION, NOT PREVIOUSLY TRANSLATED.

By Dr. ALFRED BRAUN, New York.

I.

PERIOSTITIS AND OSTEOMYELITIS OF THE ROOF OF THE ORBIT.

By Dr. V. AMMON, Munich.

It has long been recognized that inflammatory processes in the orbit may resolve without any operative interference. Fiser recommends the use of moist heat in inflammatory conditions of the orbit, and advises that one should not be in a hurry to resort to operative measures.

The following case, seen by the author, shows the danger of the expectant treatment in some cases.

The patient, twenty years of age, had a facial erysipelas. On the 7th day of the disease, there was an involvement of both lids of the right eye, especially of the upper lid. There was slight œdema of the bulbar conjunctiva and some swelling in the region of the right tear-sac. On the 13th day, the temperature dropped to normal.

There was slight restriction of motion upward of the right eyeball. Vision $= \frac{4}{6}$. Slight headache.

In the course of the next few days, under moist hot compresses, the swelling of the lids and the chemosis disappeared.

On the 25th day, it was possible to feel in the depth of the orbit, above and internal to the eye, a short spindle-shaped mass, about as thick as a lead-pencil. There was no fluctuation, and no pain. In the course of the next few weeks, this mass disappeared.

After eight weeks, there appeared, suddenly, headache

and vomiting, then choked disk. In two weeks, there was stupor, with high temperature, with death in two days.

Autopsy showed an abscess in the right frontal lobe, and acute basilar leptomeningitis. There was a necrotic area in the roof of the right orbit. The periosteal covering was smooth, and unchanged on the side toward the brain.

About 1*cm* in front of the centre of the right lesser wing of the sphenoid was an area of roughened bone, in the centre of which was a small perforation. There was a thickening of the periosteum over this area.

The pus showed a pure culture of staphylococci.

This was not a case of orbital phlegmon, but a localized periostitis and osteomyelitis of the roof of the orbit.

The author does not believe it advisable to make exploratory incisions into the orbit in cases of orbital inflammations where a definite abscess cannot be made out, on account of the improbability of reaching the pus, and on account of the liability of injuring important structures in the orbit.

If there is any indication of involvement of the orbital roof, the author advises a detachment of the periosteum from the bony roof. In this way, disease of the bone or periosteum can be determined. If there is an abscess in the orbit, it can be reached by making an incision through the periosteum.

A horizontal incision is made down to the bone, at the lower border of the eyebrow. The periosteum is elevated down to the orbital margin, and then backward on the roof.

This method of treatment was employed in the following case of the author:

A man, twenty-two years of age, had a sudden onset of headache, radiating from the right eye, with swelling of the upper lid of this eye. Temp. 38.1°C. The swelling of the upper lid gradually increased, until, on the 6th day, the eye could no longer be opened.

On the 7th day, the eye was displaced downward; some interference with rotation upward. Extreme tenderness on deep pressure over the roof of the orbit. No fluctuation.

The above described operation was performed, and there was found a thickened reddened periosteum. A strip of iodoform gauze was placed between periosteum and bone. The temperature dropped, and the headache disappeared.

Two days later, there appeared two perforations in the periosteum, about 1*cm* behind the orbital margin, through

which there was an abundant purulent discharge. In a few days the swelling disappeared, and the suppuration ceased.

II.

CLINICAL AND THEORETICAL CONTRIBUTIONS TO THE STUDY OF MYOPIA.

By Dr. HEINE, Breslau.

Certain forms of myopia are made progressively worse by near work.

There is a form of myopia due to an accidental error in the relationship between the length of the ball and the radius of curvature of the cornea.

A diminished radius of curvature, with a normal length of the eyeball, will result in a myopia. However, these cases are rare. In the majority of cases of myopia, we find evidences of dilatation and tension at the posterior pole.

Accommodation can have no effect upon the progress of myopia, since it has been proven that there is no increase in intraocular tension during the act of accommodation.

The dragging effect on the choroid during accommodation must also be disregarded, since this effect occurs only in the anterior part of the choroid, whereas the myopic changes are limited to the posterior half of the globe.

A thin and weak sclera is present in all of the cases of progressive myopia.

There are no inflammatory changes to be seen in these eyes.

The changes are all due to mechanical causes, principally to tears in the lamina elastica of the choroid.

Whether, in order to bring about a dilatation of the globe, an increased intraocular tension is necessary, or whether the weakness of the sclera is such that a normal intraocular tension suffices to cause a dilatation; these questions must be left open.

For the occurrence of a myopic conus, a firm adhesion between the lamina elastica and the interstitial nerve tissue at the temporal side of the optic nerve entrance is necessary.

There is a retraction of the lamina elastica, which is followed by a fold of nerve fibres. This is followed by circum-

scribed atrophy of the choroid, in the region of the conus, due to pressure and dragging of the elastic lamina.

Salzman considers the formation of a conus to have a beneficial effect in myopia, as it diminishes the tension in the macular region. But this advantage is counteracted by the injury to the nerve fibres caused by traction of the elastic lamina.

During the act of convergence, there is a contraction, to a greater or lesser degree, of all the external ocular muscles.

This must necessarily increase the intraocular tension.

In many cases of myopia, there is a dynamic divergence. In these cases, the effort at convergence is increased, thus increasing the intraocular tension.

The obliqui draw the eye forward, and the recti, backward.

When they all act together, there is necessarily an increase of intraocular tension.

In low orbita, the pressure effect of the obliqui is increased.

The shape of the head may also be a factor, as in broad heads the interpupillary distance is greater, thus necessitating a greater range of motion in the act of convergence.

The author considers the most important point in the pathology of myopia to be an inherent weakness of the sclera.

In the treatment of myopia, it is necessary to avoid everything which leads to excessive contractions of the external ocular muscles.

A myope should be given a full correction for distance, in order to avoid the habitual narrowing of the palpebral fissure, which most myopes resort to, in order to improve their vision.

This causes increased intraocular tension.

A myope should not be given a weaker glass for near work, for the following reason: In adjusting the eyes for near work, there is a certain amount of convergence, accompanied by a certain degree of accommodation. If the myopia is not fully corrected for near, the accommodative impulse is suppressed, in order to see clearly. This gives rise to an attempt at divergence, in order to overcome which, the attempt at convergence is increased. This naturally causes an increase of tension.

Glasses should be worn constantly, as the repeated taking off and putting on of glasses often gives rise to asthenopic symptoms.

Myopes should be examined at least once or twice every year, in order to see whether there has been any progress in the myopia, and if so, to give the full correction.

Latent divergence is favorably influenced by giving the full correction, even without the use of prisms.

In many cases, the vision is somewhat improved after the myope has worn his full correction for some time. The patient seems to interpret the pictures better.

In some cases, there is a diminution of the myopia after a time.

III.

THE EYE SYMPTOMS IN MULTIPLE SCLEROSIS.

By Dr. KAMPHERSTEIN, Breslau.

The author describes the eye symptoms in 37 cases of multiple sclerosis, in 23 of which the diagnosis was positive. In the remaining 14, the diagnosis was very probable.

Most of the cases occurred in young individuals.

I—OPHTHALMOSCOPIC FINDINGS.

In 24 cases, there were ophthalmoscopic changes.

The most common change was temporal pallor, bilateral in 8 cases, and unilateral in 10 cases. There was incomplete optic atrophy in 3 cases; complete bilateral optic atrophy in 1 case; a sector-shaped pallor in 2 cases; and optic neuritis in 1 case.

It is very rare to find complete blindness in multiple sclerosis, even where there is complete optic atrophy.

Many cases appear to be cases of spastic spinal paralysis, with only the optic atrophy to indicate the cerebral involvement.

Bruns and Stölting state that the occurrence of optic neuritis, many years before the appearance of the other symptoms, is characteristic of many cases of multiple sclerosis.

II—CHANGES IN THE VISUAL FIELD.

In 5 cases, there was an absolute central scotoma; in 5

cases, a relative central scotoma; in 3 cases, a central scotoma with peripheral contraction of the field; in 1 case, green was not recognized in the entire field.

III—PUPILLARY SYMPTOMS.

The pupillary changes in multiple sclerosis have not the diagnostic value that they have in tabes.

Miosis is fairly common, but the reaction to light is preserved, in contradistinction to tabes.

In 4 of the author's cases, there were pupillary anomalies. In 3 cases, there was anisocoria. Of these 3 cases, 1 had temporal pallor of both disks, the right pupil was dilated, did not respond to light and convergence; the left pupil was narrow, and reacted slowly to light and convergence.

In a second case, the right narrower pupil reacted more slowly to light than the left.

In 1 case, both pupils were equal, but the reaction was slower in the right than in the left eye.

IV—OCULAR PARALYSES.

Ocular paralyses were found in 10 cases. The abducens is most commonly involved. In 4 cases, there was unilateral abducens paralysis. In 2 cases, it was bilateral.

The third nerve was involved twice; in 1 case, the left internal rectus, and in 1 case the left superior rectus.

V—NYSTAGMUS.

Nystagmus was present in 30 cases. Of these, 26 cases had nystagmus only in extreme positions of the eye.

In 2 cases, there was marked nystagmus, even in the primary position.

The nystagmus is due, usually, to disease in the midbrain, corpora quadrigemina, medulla, or cerebellum.

IV.

A CONTRIBUTION TO THE STUDY OF INJURIES FROM PERCUSSION CAPS.

By Dr. CARL BÄR, Innsbruck.

A. W., fifteen years of age, struck a percussion cap with a hammer, on Nov. 23, 1902, and felt something strike his

right eye. The eye became painful and red. Two days later, he saw a physician, who could find no wound on the globe. With the ophthalmoscope, he made out a white mass in the vitreous.

On Dec. 4th, he came to the clinic, where the following condition was found:

Slight œdema of upper lid of right eye. Intense ciliary congestion. About 4*mm* to the inner side of the cornea, a depressed scar in the sclera, 1½*mm* long, can be made out with difficulty. Aqueous slightly turbid. Iris discolored.

Posterior synechiæ.

Floating opacities in vitreous. Edges of disk somewhat blurred. To the outer side of the disk is a large white sac-like structure, which trembles slightly when the eyeball moves.

It is about 4 disk diameters long, and a little over one disk diameter wide. The height of the mass is 7 dioptres, *i. e.*, 2.1*mm*.

There are no blood-vessels seen over it.

Sight = movements of hand.

Patient was given atropin and mercury inunctions.

On Dec. 8th, Prof. Bernheimer attempted to puncture the sac. The externus was divided and the eyeball drawn inward. The eyeball was punctured just external to the nerve. Some vitreous escaped, and a trace of yellowish sticky fluid. A sound was introduced but could find no foreign body Ophthalmoscopic examination showed the sac in the same position. The wound was closed.

On Dec. 11th, a broad detachment of the retina is seen above the sac.

On Dec. 14th, the eyeball tension is considerably diminished and the retinal detachment has increased.

Eyeball was enucleated on Jan. 3, 1903.

Macroscopic Findings.—The eyeball was hardened in formation, and divided horizontally, through the optic entrance.

There is a circumscribed thickening of the choroid, in the macular region. The retina is detached in its posterior and inner portions. Somewhat below the optic entrance, and a little externally, is a sharply circumscribed yellowish brown abscess in the vitreous, about the size of a pea, in the middle of which is a fragment of a percussion cap, 1.6 x 0.75*mm* in size. The abscess lies upon the detached retina. From this mass, there passes inward toward the ora serrata, a linear, indistinct, light colored prolongation. The abscess is bounded in front, within, and behind by the retina. The sections give the reaction for copper, with potassium dichromate and nitric acid.

Microscopic Findings.—Iris and ciliary body contain inflammatory infiltrates. Fibrin in anterior chamber. Disk shows inflammatory changes. At the site of the puncture, the fibre bundles of the sclera are separated, and their place taken up by new connective tissue. The superficial layers form a triangular projection into the vitreous, covered by granulation tissue, which surrounded the abscess.

The choroid is divided at this point. The torn edges of the choroid are infiltrated with leucocytes, and the vessels dilated.

In the macular region, there is a thickening of the choroid. The individual layers of the choroid cannot be distinguished. They are replaced by granulation tissue.

In the vitreous there is seen, around the foreign body, a dense collection of pus cells, which are changed to detritus, immediately about the fragment. The abscess is surrounded posteriorly, mesially, and in front, by a thick connective-tissue membrane.

This membrane is continuous with the nerve-fibre layer of the detached retina. From the depths of some of the folds, connective-tissue strands pass to the abscess sac, and become continuous with it.

The retina is considerably thickened, especially the nuclear layers, and contains numerous leucocytes.

From these findings, it is evident that the fragment passed through the sclera, the ora serrata, and the vitreous, the macular region, where it injured the retina, and the superficial layers of the choroid. From there, it rebounded, and finally lodged between the macula and the disk. Through the chemical action of the foreign body, a localized purulent inflammatory process was set up, involving also the retina.

V.

SUDDEN OCCLUSION OF THE CENTRAL ARTERY, WITH NON-INVOLVEMENT OF A PARAPAPILLARY AREA OF THE RETINA.

By Dr. FRITZ FRÄNKEL, Strassburg.

J. H., 52 years of age, became suddenly blind in the left eye, while stooping over to lift a heavy weight. The next day he was seen by the author.

In the left eye, the pupil is normal in size, and shows no direct reaction to light. There is no perception of light.

The disk is blurred in outline, and the retina is milky

white in color, almost to the periphery. The veins are normal in size, but the arteries are very narrow.

In the macula is a small cherry-red spot, to either side of which is a small horizontal narrow red band. External to the disk is an area, which is normal in color, about 1½–2 disk diameters wide, and 1 disk diameter high. It stops about 1 disk diameter from the fovea.

Tension normal.

General examination shows arterio-sclerosis, with blood-pressure of 115.

Paracentesis of the anterior chamber was done; atropin was instilled. The aqueous was allowed to flow off several times.

On the eighth day, patient can count fingers, in a small area, above and external to the fixation point.

On ophthalmoscopic examination a cilio-retinal vessel, is seen emerging from the temporal border of the disk, and passing across the centre of the portion of the retina.

The cause of the interrupted circulation has long been a subject for discussion.

The position of the interruption has been determined to be behind the point of division of the central artery, on the disk.

It has been determined, experimentally, by ligating the carotid, that an obstruction situated proximally to the point where the central retinal artery leaves the ophthalmic artery, has only a temporary effect upon the circulation of the retina. The retina may be nourished by anastomoses of the terminal branches of the ophthalmic artery.

The various causes to which the interrupted circulation is ascribed are as follows:

1. Embolism (v. Graefe), resulting from vegetations on the heart valves, or atheromatous masses in the aorta or carotid.

Recent cases are rarely seen on the autopsy table, and the differential diagnosis between an old organized thrombus and an old embolism is almost impossible to make.

2. Michel ascribes a thrombosis on the distal side of the narrowed portion of an arterio-sclerotic vessel as the cause of the stoppage. The thrombus is formed when there is a sudden drop in the blood-pressure.

3. Thickening of the vessel-walls, due to endarteritis, without secondary thrombosis (Reimar).

4. Spasmodic contraction of the arteries (Wagenmann and Sachs).

Against this theory is the fact that the retinal artery is very poor in muscular fibres, and spasmodic contractions of the arteries usually extend over large areas, whereas in the cases described the contraction was supposed to be localized.

5. Hemorrhages into the optic sheath or nerve.

6. Hoppe described in one case, a sort of valvular closure of the vessel.

In all the cases recorded, of obstruction of the central artery, with preservation of a parapapillary area of the retina, this area was supplied either by a cilio-retinal vessel or by a macular branch of the central retinal artery. In the latter cases, the obstruction was distal to the point of the origin of the macular branch.

VI.

JAVAL-SCHIÖTZ'S OPHTHALMOMETER, WITH COMPLEMENTARY COLORED MIRES.

By Dr. A. STREIT.

In the ordinary ophthalmometer, the images of the mires are surrounded by a narrow colored halo, due to the presence of the Wollaston-prism, thus making it rather difficult to tell just when the images touch each other.

To overcome this, the author has placed two plates of glass (one in front of each of the transparent mires), each of the plates containing one of a pair of complementary colors, for instance one red, and the other greenish-blue.

In this way, the colored halo is avoided, and the two images are seen, one red and the other greenish-blue. If they overlap, a white line results which can be distinguished, no matter how narrow it is.

VIII.

ANOTHER CASE OF EVULSION OF THE OPTIC NERVE, OBSERVED FOR MANY YEARS.

By Dr. ADOLF GENTH, Basel.

Evulsion of the optic nerve is a very rare accident. Eight

cases have been reported up to the present. The case observed by the author was as follows:

H. A., 25 years of age, a student, was struck on the face several times, by some unknown object, on the evening of Dec. 12, 1898. This was followed immediately by profuse bleeding from the nose and left eye. When he presented himself at the clinic, the following condition was seen:

There is moderate nose-bleed. There is a large, gaping irregular wound at the root of the nose, extending to the inner angle of the left eye. There is a smaller wound in the left eyebrow. The lids are swollen and ecchymotic. The lower lid is torn at the nasal portion of its insertion, the separated portion containing the punctum. Attempted examination of the eyeball results in profuse bleeding. Patient was put to bed, and an ice-bag applied.

Three days later, the swelling had gone down considerably, and the bleeding stopped, so that the globe could be examined. There is a diffiuse cloudiness of the cornea. The pupil is dilated, and immobile. There is chemosis of the bulbar conjunctiva, and restriction of motion in all directions. There is exophthalmos.

V =0. There is a coloboma of the iris upward. On oblique illumination, a reddish reflex is obtained from the depth of the vitreous.

On Dec. 15th, the cloudiness of the cornea has diminished. The exophthalmos has diminished. There is exudate on the anterior lens capsule.

On Dec. 31st, a symblepharon, which has formed in the nasal portion of the lower lid, is divided, and a blepharoplastic operation is done.

Examination of the fundus, on Jan. 7th, shows numerous opacities of the vitreous. In the region of the disk is a white confluent mass, in front of which is a hemorrhage.

Two weeks later, there is seen in the region of the disk, a whitish area, greenish gray in places. It is deeper than the surrounding fundus. This is surrounded by a blood clot.

There is enophthalmos. The symblepharon has partially reformed. There is restriction of mobility. Pupil is dilated and immobile.

V =0. Tension somewhat diminished.

Four and one-half years later, the patient was again seen. The condition is practically unchanged.

IX.

CONTRIBUTIONS TO THE PATHOLOGICAL ANATOMY OF THE LACHRYMAL APPARATUS.

By Dr. G. ISCHREYT, Libau.

I—TRACHOMA OF THE CANALICULUS.

Patient with trachoma, in whom the upper lid, in the region of the canaliculus, showed a tumor-mass about the size of a pea. The punctum was seen on the anterior surface of the mass. The mass was excised.

The canaliculus consisted of an outer layer of striated muscle-fibre, a tunica propria consisting of connective tissue, and a stratified squamous epithelial lining.

The tumor consists of a trachomatous round-celled infiltration in the region of the canaliculus. This infiltration has led to a secondary involvement of the canaliculus. The changes in the canaliculus consist in a moderate infiltration of the muscular layer, a marked infiltration of the tunica propria, and a degeneration of the epithelium.

II—CHANGES IN A PALPEBRAL LACHRYMAL GLAND, IN A CASE OF OLD TRACHOMA.

M. K., 39 years of age, was first seen on April 25, 1903. She had an old cicatricial trachoma, with pannus in both eyes. There is marked epiphora, with trichiasis in the right eye. On April 26th, a skin graft was done on the right lower lid. On May 7th, the right palpebra lachrymal gland was incised.

Examination of the gland showed retention of secretion, accumulation of fat-lobules, and structural changes in the epithelial cells.

The retention of secretion is due to the cicatricial contraction of the conjunctiva. The accumulation of fat and the structural changes in the epithelial cells are degenerative changes, due to interference with nutrition.

III—PROLAPSE OF THE PALPEBRAL LACHRYMAL GLAND.

J. N., 1½ years old, had a swelling in the left upper lid, at the beginning of November, 1902. The lids became inflamed and swollen so that the eye could not be opened. At the beginning of December, an abscess

appeared above the upper lid and below the eyebrow, and discharged some pus. The swelling of the lids receded, and in the palpebral fissure appeared a rounded red swelling. On examination, it is seen that the upper fornix is prolapsed, and contains the palpebral lachrymal gland.

The mass was removed, April 24, 1903.

A purulent inflammatory process in the region of the roof of the orbit undoubtedly resulted in a destruction of the supporting structures of the gland, with a consequent prolapse.

Bending of the ducts and vessels resulted in retention of secretion and hyperæmia.

X.

A CONTRIBUTION TO THE STUDY OF CHRONIC PROGRESSIVE EXTERNAL OPHTHALMOPLEGIA.

By Dr. W. ALTLAND, Breslau.

P. O., 51 years of age, came to the clinic on May 23, 1903, with the following history:

His parents and six brothers and sisters are alive and well. One brother died at the age of thirty-seven, of an unknown sickness. At the age of twenty, he enlisted in the army, but was soon dismissed on account of poor sight. No lues. He drinks a moderate amount of whiskey, and smokes seldom.

In 1874, the right upper lid gradually drooped There was never diplopia. He does not know whether the eye was movable at that time. He gave up his work as watchmaker, and became a farmer. In 1894, the left upper lid gradually began to droop. Since then, the patient is obliged to lift his left upper lid with his hand, when he wishes to see anything. For a long time, it has been necessary for him to rotate his head, when he wishes to see anything at his side.

Present condition: right upper lid covers cornea completely. Globe in primary position, and immobile. Pupil reacts normally.

Ophthalmoscopic examination negative. In left eye, the ptosis is not complete. Globe directed outward. Slight exophthalmos in both eyes.

Neurological examination made by Prof. Wernicke showed no marked anomalies in the rest of the nervous system.

The patient was given glasses, with an arrangement on the frame of the left glass to hold up the lid.

XI.

ON THE FINAL RESULTS OF PHAKOLYSIS.

By Dr. GELPKE, Karlsruhe.

The author has a series of 120 myopic eyes, from which he has removed the lens, and whom he has observed for at least two years, after operation.

The patients ranged from six to fifty-nine years of age. The periods of observation, after operation, ranged from two to nine years.

Before operation,

74.2%	had a vision of	0.1–0.2
23.3%	" " " "	0.3–0.5
2.5%	" " " "	0.6–0.8

After operation,

15.9%	had a vision of	0.1–0.2
38.3%	" " " "	0.3–0.5
38.3%	" " " "	0.6–1.0

In 5%, there was loss of the eye (1) through infection, (2) through iridocyclitis, and (3) through detachment of the retina. In 2½% there was permanent diminution of vision.

In 89.2% there was improvement of vision from twice to twenty times the original vision. In the majority of cases, the vision was doubled.

The amount of pseudo-accommodation, *i. e.*, the range in which the patient could use the eye for near vision with the same lens was as follows:

1–10*cm*	in	48.6%
11–20	" "	31.8%
21–30	" "	16.8%
31–40	" "	2.8%

The greatest amount of pseudo-accommodation occurred in the youngest individuals, and in the most intelligent.

The visual field remained the same in 54.2%.

It was increased in 35%.

It was diminished in 5.8%.

The differences in refraction following operation were as follows:

18 D in 3 eyes.
19 D " 7 "
20 D " 18 "
21 D " 15 "
22 D " 21 "
23 D " 23 "
24 D " 13 "
25 D " 11 "

The astigmatism remained the same in 31%.
It was diminished in 17%.
It was increased in 52%.
Before operation, there were no fundus changes, in 1.7%.
There was conus, without other changes, in 21.6%.
There was retinal-pigment atrophy in 40%.
There were old chorio-retinal changes, in 34.2%.
There were recent chorio-retinal changes, in 2.5%.

In one case of extensive atrophy of retinal pigment, there occurred, two years after operation, a central chorio-retinitis. This was probably a sympathetic affection, as the other eye was phthisical.

In another case there were extensive macular changes before operation. After operation a paracentral scotoma appeared which disappeared in three weeks.

In 2 cases there was infection, in 2 cases chronic iridocyclitis, and in 5 cases retinal detachment.

In the majority of cases there was an improvement in the fundus condition.

1	operation	was	necessary	in	3.5%
2	operations	were	"	"	44.7%
3	"	"	"	"	38.6%
4	"	"	"	"	8.8%
5	"	"	"	"	2.6%
6	"	"	"	"	1.8%

In the majority of cases two operations were necessary; a discission, followed by extraction. In 38.6%, a second discission was necessary on account of the formation of a secondary cataract.

The most common complication was the occurrence of increased tension, which in most cases disappeared under

hot compresses and eserin. In a few cases, sclerotomy, or iridectomy, had to be done.

The absolute indications for phakolysis are:

1. In all cases in which the myopia cannot be properly corrected by optical means, to enable the patient to attend to his occupation.
2. In all cases of progressive myopia.

The relative indications are:

1. When the myopia can be corrected by glasses, but when the wearing of glasses is impracticable, as in waiters, servant-girls, coach-drivers, etc.
2. In old or recent macular changes, which do not yield to medicinal treatment.

Absolute contra-indications are:

1. Cases in which the myopia is well corrected by glasses, and in which the glasses can be worn without trouble.
2. Cases with chorio-retinitis in the equatorial region with considerable contraction of the field, liquefaction of the vitreous, and diminution of intraocular tension.

XII.

EXPERIMENTAL AND CLINICAL STUDIES ON THE ACTION OF ANILIN DYES ON THE EYE.

By Dr. KUWAHARA, Nigataken, Japan.

The author observed three cases in which anilin dyes had a deleterious effect upon the eye.

All three were cases of schoolboys, in which a fragment of an anilin copying-pencil lodged in the conjunctival sac.

This was followed in a day or two by inflammatory signs, with ulcer of the cornea, and perforation, resulting in anterior staphyloma.

The author then performed a series of experiments upon guinea-pig's eyes, dropping some powdered copying-pencil into the conjunctival sac. In all the cases there occurred a reddening and swelling of the lids, with keratitis, ulcer of the cornea, hypopyon, and in some cases rupture of the cornea.

The cases in which powdered graphite and powdered pastel color were used were negative.

The copying pencils are composed of kaolin, graphite,

and methyl violet. The two former substances have no effect upon the eye, but the powdered methyl violet has the same effect as the powdered copying-pencil. Other anilin dyes were used, such as ethyl violet (pyoctanin), gentian violet, and eosin, with the same results, as in the case of methyl violet.

The changes in the guinea-pig's eyes were as follows:

In the milder cases, the lids were not involved. In the severer cases, they were swollen. There is conjunctivitis, in some cases diphtheritic. In some cases there is gangrene of the lids.

In the mild cases there is a slight opacity of the cornea, which disappears after a time. The opacity may become very extensive, and involve the entire cornea. Then there is exudation into the cornea, resulting in thickening of the cornea. There is usually destruction of the epithelium and Bowman's membrane. There may be ulceration, with perforation and prolapse of the iris.

More frequently there is abscess formation, especially near the limbus. The iris and ciliary body are usually inflamed. There is exudation in the anterior chamber. The lens sometimes becomes opaque. Some cases result in panophthalmia.

XIII.

ON THE POSSIBLE CURABILITY OF NYSTAGMUS.

By Dr. N. J. CUPERUS, Zwolle, Holland.

Case 1.—M. R., 15 years of age, has a horizontal nystagmus in both eyes. It is not increased in any position of the eyes.

O.S. $\frac{5}{15}$ vision, with -10. D sphere.

O.D. $\frac{5}{300}$. Aphakia, secondary cataract.

A discission was performed on the right eye. W. $+4.00$ D sphere, the vision in the right eye went up to $\frac{5}{70}$.

A few weeks later the nystagmus had almost entirely disappeared.

Case 2.—J. M. G., 16 years of age, has been wearing the following glasses:

O.S. $+3.00$ cyl. 10° temp.

O.D. $+3.00$ spher. $\bigcirc -1.00$ cyl. 40° nasal.

He has bilateral rotary nystagmus increased on looking upward.

O.S. Counts fingers at 1.5 metre.

Shadows − 1 spher. ⊂ − 2. cyl. 30° temp. Strabismus convergens and deorsumvergens.

O.D. $\frac{5}{20}$. Shadows − 1 spher. ⊂ − 4 cyl. 50° temp.

The author suspected a spasm of accommodation, and found after the use of atropin the following condition:

O.S. Shadows + 1 spher. ⊂ + 3 cyl. 10° temp.

Vision w. + 3. cyl. 10° temp. = $\frac{5}{10}$.

O.D. Shadows + 1. spher. ⊂ + 3. cyl. 60° temp.

Vision w. + 1.50 ⊂ + 2. cyl. 60° temp. = $\frac{5}{10}$.

The use of these glasses had no effect on the nystagmus.

A tenotomy on the internal rectus of the left eye was performed, with the result that the nystagmus immediately disappeared except for slight nystagmus on looking upward.

These cases seem to indicate that the nystagmus was due to reflex irritation, as the removal of the irritating cause cured the nystagmus.

XIV.

PARESIS OF THE EXTERNAL RECTUS AND SUPERIOR OBLIQUE, RESULTING FROM ATROPIN POISONING.

By Prof. K. BAAS, Freiburg.

T. B., 12 years of age, received instillations of atropin in both eyes for several weeks, as treatment for a progressive myopia. After several weeks he had sore throat, loss of appetite, uneasiness, loss of flesh, and diplopia. Examination disclosed paresis of the right external rectus and superior oblique. The condition disappeared after six weeks, without treatment.

XVI.

INOCULATION TUBERCULOSIS OF THE CORNEA.

By Dr. JINSEN NAKAGAWA, Japan.

A small quantity of a watery emulsion of tubercle bacilli was injected into the centre of the cornea of a guinea-pig, by means of a hypodermic needle. The guinea-pig died after 29 days, but not of tuberculosis.

After 5 days, there was a distinct infiltration of the cornea. There was a slight swelling of the iris. Eight days later, there was a diffuse haziness of the entire cornea. Four days later, posterior synechiæ were formed, and the iris was considerably swollen, and two days later, two grayish nodules were seen in the iris—undoubtedly typical tubercles.

Microscopic Examination.—The cornea shows moderate infiltration with leucocytes, in the lymph-spaces, between the lamellæ. At the point of puncture, the epithelium is hypertrophied. In the deeper part of the cornea behind this point is a tubercle projecting into the anterior chamber. The tubercle has broken through Descemet's membrane. The anterior chamber contains a fibrinous exudate.

The iris is thickened and infiltrated with round cells. There are several tubercles, the ciliary body is also infiltrated as well as the spaces of Fontana at the corneo-scleral junction. The anterior lens capsule is separated from the cortex by a granular exudate.

There are few tubercle bacilli in the anterior portion of the cornea, under the point of injection. They are more numerous in the deeper layers of the cornea, and are especially thick in the tubercle which is situated here.

The bacilli are limited to an area 1.2*mm* distant from the point of injection, in all directions. There are some bacilli in the anterior chamber. They are present in large numbers in the spaces of Fontana, extending into the sclera and ciliary muscle. There are numerous collections in the iris.

The method of entrance of the tubercle bacilli into the interior of the eye was doubtless as follows: they worked their way backward through the cornea, until they perforated it. They then fell down to the lower angle of the anterior chamber, and were taken up into the spaces of Fontana, whence they reached the various points within the eyeball. Possibly some bacteria were caught up by the spongy anterior surface of the iris, directly from the aqueous.

XVII.

OPHTHALMOLOGICAL MISCELLANIES.

By Prof. HOSCH, Basel.

I—ON SUBCONJUNCTIVAL INJECTIONS.

The writer believes that salt solution is not as efficacious as oxycyanate of mercury for subconjunctival injections. He believes that the latter exert an antiseptic action upon the interior of the eyeball.

In a case of irido-choroiditis with hypopyon, following a discission, the subconjunctival injection of 5 minims of $\frac{1}{6000}$ oxycyanate of mercury caused a disappearance of the hypop-

yon within a day, and five injections brought about complete cure within 2½ weeks.

In a second case of infection, following a discission, with escape of vitreous, four injections of the oxycyanate of mercury cured the condition in three weeks.

The author found opacities in the lens in a case of choroiditis in which subconjunctival injections of sodium chloride and sodium iodate had been used. He believes that the opacities might have been caused by the injections.

II—ON THE HEALING OF METALLIC FOREIGN BODIES IN THE RETINA.

The author observed a case of metallic splinter lodged in the retina, without inflammatory reaction, and with some vision for a year, and thought that the case would have no further trouble. But seven years later the eye had to be enucleated on account of pain and inflammation and blindness, with signs of a beginning sympathetic affection in the other eye.

Another case had a splinter of steel lodged in the retina for five months, without giving rise to any symptoms, then became inflamed and had to be enucleated.

The author believes that every foreign body should be removed from the retina.

III—SPONTANEOUS RUPTURE OF AN EYE WITH UVEAL SARCOMA.

A patient with angeiosarcoma of the choroid came into the clinic. On her entry the globe ruptured, and expelled the lens as well as a large quantity of blood. Examination showed a staphylomatous protrusion of the cornea, with increased tension, and a perforation behind the inner sclero-corneal margin through the ciliary body.

This is an unusual site for rupture to take place, it occurring more commonly at the points where the vessels and nerves enter the globe.

IV—A MOULD CONCRETION IN THE UPPER CANALICULUS.

Patient complained of epiphora, with purulent discharge. Examination showed swelling in region of upper canaliculus.

On pressure, there was purulent discharge from punctum. On slitting the canaliculus with Weber's knife, a small yellow concretion was delivered, which, on examination proved to consist of streptothrix. There was complete relief of symptoms.

XVIII.

A CASE OF GLAZING OF THE IRIS IN BUPHTHALMUS, AND A CRITICISM OF WEINSTEIN'S THEORY ON THE FORMATION OF DESCEMET'S MEMBRANE.

By Dr. R. HALBEN, Greifswald.

An eye, the seat of buphthalmus in a boy of six years, was enucleated by Dr. Cramer. The anterior portion of the eye is very much distended. The periphery of the iris is adherent to the cornea, over a considerable area. The adherent portion of the iris is atrophic. There is no Descemet's membrane between the cornea and adherent iris. Descemet's membrane is reflected from the posterior surface of the cornea, on to the anterior surface of the free portion of the iris, extending to the pupillary margin, and covering a portion of the posterior surface of the iris. It is covered everywhere by a layer of endothelium.

This case is a refutation of Weinstein's theory that Descemet's membrane is the result of the action of the aqueous on the posterior layers of the cornea, causing a vitrification of the latter. The case supports Wagenmann's theory, that Descemet's membrane is the result of a cuticular exudation from the endothelium lining the posterior surface of the cornea.

XXI.

ASTIGMATIC ACCOMMODATION UNDER THE INFLUENCE OF THE UNILATERAL ACTION OF HOMATROPIN AND ESERIN.

By Dr. S. BRANDES, The Hague.

The author took a series of patients with emmetropic eyes, or with slight errors of refraction, and subjected the eyes to localized action of homatropin and eserin, using homatropin in 25 cases, and eserin in 25 cases.

The homatropin was applied in crystal at the upper corneo-

scleral margin, the crystal being held there for several minutes. The eserin was applied in the same place in solution on an applicator, first using cocaine on account of the irritating quality of the eserin.

The presence or absence of astigmatism was measured by the following instrument:

Two thin threads are stretched across two rings, which can be slid along a graduated scale. One of the threads is vertical, and one horizontal. They are illuminated by a light thrown on a ground-glass plate. The head of the patient is held upon a chin-rest, and a +3. or +4. D lens placed in front of the eye to produce an artificial myopia. The two rings are then slid along the scale, until both threads are seen equally clearly. The distance between the two threads gives the measure of the astigmatism.

This is a very delicate test. The author found that in most of the cases treated with homatropin, there occurred an astigmatic accommodation, usually beginning about half an hour after the use of the homatropin, and lasting from a few minutes to half an hour.

The amount of astigmatism was always less than 1 D. It was an astigmatism against the rule.

The homatropin caused a greater degree of paralysis in the muscle fibres in the vertical meridian, so that when accommodation occurred, the anterior surface of the lens was less convex in the vertical meridian than in the horizontal.

In the cases in which eserin was used, there was an astigmatism with the rule, on account of the increased spasm of the muscle fibres of the vertical meridian.

In the cases in which eserin was used, the astigmatic accommodation occurred much sooner than in the cases in which homatropin was used.

In the cases in which homatropin was used there was an irregularity of the pupil for a time.

In some of the cases in which eserin was used there was as much as 2 D of astigmatic accommodation.

XXIII.

ON MOULD CONCRETIONS IN THE CANALICULI.

By Dr. AUERBACH, Moscow.

W. A. S., 45 years of age, received a thrust in the left eye, from the finger of a child, two months ago. A few days later, there was epiphora at the inner angle of the eye. This was followed by redness and swelling at the inner angle of the eye, with purulent discharge.

Examination showed a reddened, slightly sensitive, circumscribed swelling in the region of the lower canaliculus. Pressure upon the mass caused a drop of pus with some yellowish gray granules to appear at the punctum.

The canaliculus was slit open, and six lentil-shaped, yellowish-gray masses were delivered, which could be easily crushed between the fingers.

Healing was uninterrupted. Microscopical examination showed the masses to consist of actinomycosis. Culture and inoculation experiments confirmed the diagnosis.

XXIV.

CONCERNING VERTICAL DISPARITIES AND THE HYPERPLASTICITY OF NEAR OBJECTS.

By Dr. R. KOTHE, Bonn.

Elschnig and Heine discovered that objects viewed at a moderate distance with both eyes, as well as stereoscopic photographs, appear hyperplastic.

Helmholtz claimed that one's conception of depth depended upon the vertical disparities between the two retinal images.

But when objects are placed at a very great distance from the eye, the vertical disparities disappear, and there remain only horizontal disparities. Therefore, our conception of solidity must depend upon the horizontal disparities.

Another argument against the importance of vertical disparities is the fact that lines which lie exactly in the median line have no longitudinal disparities in the two retinal images, since these lines are equally distant from both eyes. Still we can distinguish differences in depth very readily in objects directly in the median line.

The further to the side the object is placed the greater become the vertical disparities. If our conception of depth

depended upon the vertical disparities, we would obtain the best plastic impression by looking sidewise at an object. But this is contrary to all experience. In order to obtain a proper idea of depth, we place the object directly in the median line.

Since our conception of depth is independent of vertical disparities, we cannot consider vertical disparities in the causation of hyperplasticity of objects.

Hyperplasticity is explained by the author as follows:

In order to examine an object carefully, we unconsciously bring it $\frac{1}{3}$–$\frac{1}{2}$ metre from the eyes. At this distance, we can best judge of the form and size of the object.

When the object is brought nearer, the horizontal disparities increase, and consequently the object appears hyperplastic. The farther away the object is carried, the less marked are the horizontal disparities, and the less marked is the relief of the object.

REPORT OF THE PROCEEDINGS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

By Mr. C. DEVEREUX MARSHALL.

An ordinary meeting of the Society was held at the Medical Society's rooms, London, on Thursday, January 28, 1909, Mr. R. Marcus Gunn, President, in the chair.

Mr. A. W. Ormond showed a case of **tubercle of the choroid,** and Mr. Doyne, a case showing **peculiar opacities of the cornea.**

Mr. Bishop Harman read a paper on **Four generations of lamellar cataracts.** He showed the pedigree of a family for five generations, four of which presented a marked inheritance of congenital cataract. Seventeen childships were traced, comprising 63 persons. Eight died in infancy. Of the remaining 55 it was known that 19 had congenital cataract. In no case had there been any inbreeding, or marriage with a person similarly affected. The type of cataract was, for the most part, central opacities, of varying size; some were minute, Y- or X- or star-shaped, others showed definite lamellar formation. In some cases the cataracts were of long standing, and no evidence could be found that they had progressed beyond the stage at which they were earlier seen. Probably the number of cases of cataract found did not represent the true total, for in one childship of seven members amongst whom only one case of cataract was admitted, examination of the seven showed that four had lenticular opacities. The inheritance was strictly from those who had cataract; in no case was cataract found in a child where the parents were free from the defect. When

a defect had disappeared from a branch of the family, it did not tend to reappear. The teeth usually were good, and no other developmental errors were found.

Mr. HARMAN also read notes of a case of unusually rapid development of cataracts in a boy of nine years. A year previously his vision had been recorded at school as $\frac{6}{18}$; an examination passed three months before showed that he could then write well. When seen he was quite blind; both lenses were completely cataractous, the lens matter was soft and opaque. The lenses were removed by curette evacuation at the Belgrave Hospital, and at the end of six weeks the boy left the hospital able to read $\frac{6}{18}$ with cataract glasses, and later on he saw $\frac{6}{6}$. He showed no trace of general disease, but there was some evidence of defect in his ciliary vessels.

Mr. A. S. PERCIVAL (Newcastle) read a paper entitled **Note on the colors of Benham's top,** and he demonstrated the different colors shown when the top was rotated clockwise, as compared with those when the rotation was in the opposite direction. The explanation, which was not yet certain, was highly technical, and he suggested several theories.

Mr. PERCIVAL also read a contribution entitled **Note on some rhythmic oscillations of the pupil.** He said that all were familiar with the ryhthmic contraction and dilatation seen in certain diseases, and which were usually looked upon as of grave significance. He compared this with the oscillatory discharge from a Leyden jar, which occurred under certain conditions. If it were discharged through a conductor of high resistance, the charge simply died away. If it were discharged through a good conductor, such as a coil of wire, the discharge consisted of a number of excessively rapid oscillations or surgings. He then compared the nerve cell and axis-cylinder with the Leyden jar and conducting wire, stating that, owing to disease, the discharge of nerve impulse was made in an irregular manner. He regarded the movement-tremors of disseminated sclerosis as an almost exact parallel to the oscillatory discharge of a Leyden jar.

Mr. DAVID J. WOOD (Cape Town) sent a communication on **A case of retinal exudation, with extreme distension of vessels and perhaps arterio-venous anastomosis.** He reminded members that he had contributed a similar case to

the 12th and another to the 25th volume of the Society's Transactions, and recently he had seen and examined a third instance of that rare condition. He saw the patient first in 1902, and ordered glasses for her; there was then no complaint of the sight being bad. Later, as she had an attack of dimness of vision, he examined her fundi, and found large blood-vessels running up to a patch on the upper part of the fundus, which possibly might have resulted from a former hemorrhage. The patient, who was then fifty years of age, returned in 1907, reporting that a few days previously the right eye had suddenly failed. He found that to be due to a diffuse opacity in the vitreous; no fundus details could be made out. Then the vitreous began to clear, and the drawing he showed represented a picture of the appearance seen. There was a white area above, and enormously dilated blood-vessels could be seen running up to it from the disk. The color of the vessels, which were very tortuous, was intermediate between that of arteries and veins. From the left trunk a vessel sprang which was arterial in color, while another vessel, obviously venous, sprang from the opposite main trunk. There were fine choroido-retinal changes, which covered the inner part of the fundus. He thought the growth was probably sarcomatous, and his colleague advised excision, but he was so impressed with its likeness to his other cases that he held his hand. He hoped to report further on the case. He had not been able to hear more of his second case, already mentioned. Mr. TREACHER COLLINS described a similar case, and remarked on the rarity of the condition; and Mr. G. COATS described the pathological findings in a case he had thoroughly examined.

A clinical meeting was held at the Medical Society's rooms on Thursday, February 11, 1909, Mr. E. NETTLESHIP in the chair.

Mr. BISHOP HARMAN showed **models, on an economical plan, for the diaphragm test**, and **a substitute for smoking** for the use of cases of tobacco amblyopia who felt the loss of their tobacco. The latter consisted of quassia made up in the form of chewing-gum, and the idea was suggested to him

by the remark of a night-watchman with tobacco amblyopia who had to sit by a fire all night and did not know how to employ his time if he did not smoke.

Dr. A. LEVY showed **a case of obstruction of the cilio-retinal artery.** The vessels were sclerosed, and that was the only evidence of arterial disease, the viscera being sound. Mr. CUNNINGHAM showed **a case of aniridia** and gave the family history of the condition. Mr. NETTLESHIP brought three drawings illustrating hemorrhages, believed to be choroidal, following a blow on the eyebrow, also choroiditis behind the retinal veins. Mr. HANCOCK showed **a case of pituitary neoplasm with ocular symptoms** in a child. The physique of the child seemed to suggest it was an early case of acromegaly, and skiagrams showed an abnormal appearance in the pituitary region. Mr. MACNAB called his attention to a paper on the subject by Uhthoff at the Heidelberg Congress. Dr. MACKENZIE DAVIDSON exhibited the skiagrams of the case, showing a small abnormal opacity in the region of the pituitary body, in front of the sella turcica. He said he had never seen an appearance of that nature before. Mr. LESLIE PATON said he had seen a case of similar nature, at intervals in the last six years. The boy developed intense optic atrophy in both eyes, evidently due to pressure on the chiasma, and the sequel was that he was now in an asylum. Mr. Macnab gave a synopsis of the paper by Uhthoff, to which allusion had been made. Mr. FISHER questioned whether the skiagram enabled one to say that the bony cavity containing the sella turcica was enlarged. Mr. E. W. BREWERTON showed a case of **cyst of the iris**, which at first had the appearance of sarcoma. Mr. RAYNER D. BATTEN showed **two cases of hereditary retinitis.** He believed it was a retinitis with secondary atrophy, rather than an actual atrophy.

An ordinary meeting of the Society was held in the Medical Society's rooms, London, on Thursday, March 11th, Mr. W. H. H. JESSOP occupying the chair.

Dr. G. CARPENTER showed a **post-mortem specimen illustrating oxycephaly,** and Mr. SYDNEY STEPHENSON mentioned a similar case which he had had, commenting on the shallow orbit and the consequent ease of dislocation of the eyeball.

Mr. J. ROWAN showed some **fine stereoscopic color photographs, by the Lumière process,** of eye conditions. Mr. EDRIDGE-GREEN exhibited a **new form of lantern for the detection of defects of color vision.** Mr. PARSONS showed **a case of unilateral optic neuritis with white spots in the retina;** and it provoked a long discussion, in which the Chairman, Mr. NETTLESHIP, Dr. F. E. BATTEN, and Mr. BISHOP HARMAN took part. Mr. JESSOP showed a case of **keratitis punctata with a history of erythema nodosum.** Mr. MAYOU and Dr. L. GUTHRIE showed **a case of optic atrophy (retrobulbar) with cerebellar symptoms in a child.**

Mr. E. TREACHER COLLINS read a paper on **Congenital anterior staphyloma.** Mr. Collins described the case of a child born with an opaque, vascular, staphylomatous cornea, who never had any discharge from the eye. When fifteen months old he performed a Mules's evisceration upon it, and subsequently made a pathological examination of the elliptical piece removed from the front of the eye. It was found that Descemet's membrane and the ligamentum pectinatum were absent, there was no stroma to the iris, and the lens was also malformed. Most cases of congenital anterior staphyloma have been attributed to interuterine ulceration. Mr. Collins thought that a case in which there was complete absence of Descemet's membrane and the ligamentum pectinatum could not be accounted for by ulceration, and must be attributed to some developmental defect. He suggested that there had been a failure in the differentiation of the mesoblast, which intrudes between the lens vesicle and the surface epiblast, into its several layers. Normally there developed from it the substantia propria of the cornea, Descemet's membrane, its lining endothelium, and the antero-fibro-vascular sheath of the lens. From this latter the fœtal lens largely received its nutrient supply and the stroma of the iris was to a great extent formed. A failure in the differentiation of the several structures, or atypical development of the intruding mesoblast, might, as in the case under consideration, lead to a vascularized, thickened, fibrous mass, in place of the substantia propria, an absence of Descemet's membrane, of the stroma of the iris, and a malformed lens. He concluded by referring to several other congenitally malformed eyes, in

which he had found defects in development of Descemet's membrane or the ligamentum pectinatum of a less extensive character. The paper was discussed by Mr. PARSONS and Mr. G. COATS, who failed to agree with all that Mr. Collins had advanced.

Mr. E. NETTLESHIP contributed seven new pedigrees of hereditary cataract: 1, 24 cases of lamellar cataract in four generations; 2 and 3, coraliform cataract, one of them containing 20 cases, in four generations; 4, 5, 6, and 7, pedigrees of senile and presenile (or juvenile) cataract in from two to four generations, some of them illustrating "anticipation," *i. e.*, the occurrence of disease at an earlier age in the younger generation. Two of the pedigrees showed the introduction of a second heritable disease from an outside non-cataractous stock, goitre in one instance, insanity in the other.

Dr. F. W. EDRIDGE-GREEN and Mr. C. DEVEREUX MARSHALL submitted a paper on **So-called artificially produced temporary color-blindness.** They stated that Professor Burch, of Oxford, had read a paper before the Royal Society, which was published in the Philosophical Transactions in 1898, giving the results of his experiments, in which he split up direct solar light with a spectroscope, and then collected the rays of the individual colors with a convex lens, and saturated his own eye with any desired color. He then examined a spectroscope illuminated with diffuse daylight, and stated his results. He found that he could produce temporary color-blindness to any color in this way. His most important point was that by saturation with light at the "D" line, red and green blindness supervened, and these colors could not be perceived, and this he held to support the complex nature of yellow light, the Young-Helmholtz theory of color-perception. Messrs. Edridge-Green and Marshall criticised his experiments. They thought that if direct sunlight were focussed in the retina, not only temporary, but probably permanent blindness might be produced, and anyhow the eye would be incapable, after much treatment, of making accurate observations on a feebly-illuminated spectrum. They produced fatigue in their own eyes with a sodium light, and then found that yellow and orange became obliterated, and that red and green met in the spectrum, and that there

was no diminution of those two colors. Other experiments were repeated with different colors, and in most of them they disagreed with Professor Burch's results, which, they held, were due to faulty methods of conducting the experiments. These facts are, they contend, only explicable on the psycho-physical theory of color vision (Edridge-Green's theory).

REPORT OF MEETINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

GENERAL MEETING OF THE ACADEMY, DECEMBER 3, 1908. THE PRESIDENT, DR. JOHN A. WYETH, IN THE CHAIR.

The subject of the evening was **The diseases of the eye and orbit depending on diseases of the accessory sinuses.**

Dr. GEORGE S. DIXON spoke on **The anatomical relations of the orbit to the accessory sinuses of the nose.**

The paper was illustrated with lantern slides.

Dr. ARNOLD KNAPP discussed the topic from the standpoint of the **ophthalmologist.** The most striking orbital complication of nasal sinus disease was the one due to a dilatation of the frontal and ethmoidal sinuses, causing a displacement of the orbital contents without inflammatory signs, the so-called mucocele. The eye was usually uninvolved. The only treatment was surgical. Inflammation of the sinuses was associated with external or orbital inflammatory signs whenever the inflammation invaded the intervening bony wall. In mild cases there was no macroscopic change in the bone, but a periostitis was present over the floor of the frontal sinus with swelling and redness of the eyelid, or over the ethmoidal os planum, causing exophthalmos. This condition might resolve of itself or yield to intranasal treatment. The orbital contents were generally not involved in these cases beyond slight venous congestion at the optic disk. Subperiosteal abscesses were not infrequent in children, the infection being transmitted by the ethmoid labyrinth. In operating on these cases a curved incision was made along the inner orbital margin, and on retracting the periosteum a small collection

of pus would be encountered between the periosteum and the bone, and there was usually a small irregular defect in the os planum. The opening in the bone should be slightly enlarged and the contiguous ethmoidal cells curetted. If the orbital periosteum was invaded, involvement of the orbital structures resulted, either cellulitis or abscess. The important part played by nasal sinusitis in producing orbital cellulitis and abscess had only been recognized within the last few years. Under these circumstances the usually practised blind incisions into the orbital cavity were not surgical; treatment should be based on the lines of the orbital operation for nasal sinus empyema. There should be broad exposure by an incision along the orbital margin, careful inspection of the orbital walls, and proper drainage according to the individual case. The importance of the maxillary antrum in causing orbital complications has been exaggerated. An important group of ocular complications of nasal sinus disease was that involving the optic nerve. The recent investigations of Onodi had shown that the optic nerve was frequently in close relation to the posterior ethmoidal cells and that the extreme thinness of the intervening wall made the involvement more likely than in the case of the sphenoid. It was of special interest that the optic nerve was involved in the form known as retrobulbar neuritis in which a central scotoma was the characteristic functional defect. The prognosis of these cases was excellent, and now that ophthalmological attention had been focussed on this interdependence of the nose and eye, some of the hitherto obscure cases of acute retrobulbar neuritis would be recognized and nasal treatment promptly instituted. Ocular paralyses were not infrequently the only manifestations of orbital complications. Neuralgia, especially ciliary and retrobulbar, was frequently due to sinus affections and asthenopia was a common symptom. According to Kuhnt muscular asthenopia, accommodative asthenopia, and contractions of the visual field were the functional disturbances observed in nasal empyema in the order of their frequency. There was a group of eye affections comprising irido-choroiditis, glaucoma, and detachment of the retina, with which certain authors had brought sinus disease in etiological relation. This was a

subject upon which additional information is required. Kuhnt had stated that he had never seen a case of iritis or choroiditis caused by sinus disease, but thought that cyclitis, especially the form chiefly characterized by opacities of the vitreous, could depend on this cause. He had never observed glaucoma to be caused by nasal disease, but believed that in predisposed eyes an attack might be brought on by a sinus affection. The reported cases of detachment of the retina associated with nasal sinus disease were not convincing. In closing, the reader expressed the conviction that the list of ocular disturbances which could be produced by sinus affections was not exhausted and that there was a great deal of careful work still to be done.

Dr. C. G. COAKLEY treated the subject from the standpoint of the **rhinologist**. The affections of each nasal accessory sinus were described in turn and the ocular complications produced by them. Orbital disease as a result of disease of the maxillary sinus was rather rare. This was because the region of the maxillary ostium easily gave way under pressure, otherwise exceptionally the secretion of the antrum might perforate the orbital floor and cause an orbital cellulitis. Dentigerous cysts and malignant disease of the antrum may involve the orbit secondarily. Disease of the frontal sinus causes more frequent orbital complications. The diagnosis of acute or chronic involvement of the frontal sinus was comparatively easy with the aids of modern diagnostic methods. In a large proportion of the cases the naso-frontal duct was partially patent, and the presence of a certain amount of pus in the nose directed attention to suppuration in some of the accessory sinuses. In the acute cases the extreme tenderness of the bone of the affected side and the appearance of swelling below the supra-orbital arch made it probable that the frontal sinus was affected. In these cases a good skiagraph was a most valuable aid. He had seen some cases, however, where there was such evident involvement of the frontal sinus, accompanied by such manifest orbital cellulitis, that it did not seem advisable to delay operating until a skiagraph could be made. The ethmoidal cells, if diseased, were much more liable to involve the orbit than either the maxillary or the frontal sinuses. Orbital cellulitis occurred more frequently

as a result of ethmoidal disease than it did from disease of the frontal sinus. It was very difficult in some instances to differentiate the source of an orbital cellulitis, whether from the frontal, ethmoidal, or sphenoidal sinuses. In the severer types of involvement it was seldom that one group of sinuses alone was involved, there was usually a combination and sometimes all of them were involved. The surgeon in operating should invariably investigate all three sinuses, and if they were found diseased, perform a radical operation. The sphenoidal sinus was next considered. This sinus varied greatly in its position in reference to the apex of the orbit. If the sinus was large it might partially or completely encircle the optic nerve as it passed through the foramen. There was a large class of cases of ethmoidal and sphenoidal disease falling under the observation of the rhinologist without any involvement of the optic nerve. In the absence of any visible secretion or any appearance of local inflammation in the posterior portion of the nares as compared with the anterior portion, the diagnosis of sphenoethmoiditis was difficult. There was no way of satisfactorily detecting the condition of the sphenoid and posterior ethmoid cells without, in a large proportion of cases, removing the entire middle turbinate. Then if the septum were markedly deflected the anterior wall of the body of the sphenoid came into view, and one might enlarge considerably the sphenoidal opening and the posterior ethmoids so as to inspect the interior. In operating there were two difficulties to contend with: first, the fact that many patients complained of considerable pain even when thoroughly cocainized, so that it was impossible at a single sitting to do all that was necessary; and secondly, that in spite of the use of suprarenal extracts the bleeding was often so great as to prevent one getting a proper view of the operative field. If this happened, the surgeon would find it impracticable to perform any further surgical work on the patient for a period of about two weeks. From a study of nineteen cases referred to him for retrobulbar neuritis, he found that only three of them showed any condition as a result of nasal examination that would make one suspect any disease of the sphenoid or ethmoid. When operated upon these cases had large sphenoid and ethmoid

cavities, the mucous membrane was œdematous, and considerable secretion existed in the cavities. One case was totally blind in one eye and within a few weeks after operation recovered almost perfect sight. A second case that could barely distinguish light made an almost perfect recovery. A third case was totally blind and had made a perfect recovery. Ten patients with retrobulbar neuritis had their middle turbinates removed and their sphenoidal and ethmoidal cavities opened without finding any disease.

Dr. WILLIAM C. POSEY of Philadelphia opened the general discussion and said that in recent years an ocular symptomatology of sinusitis had been evolved, which was incomplete by reason of the lack, in nearly all instances, of pathological evidence to prove the dependence of diseases of the eye and orbit upon conditions within the sinuses; nevertheless the changes in the eye caused by sinusitis had been observed by so many writers that it might be said to be now fairly well established. Ophthalmologists realized that the treatment of abscess of the orbit demanded that not only should the pus be liberated from the orbit, but that the origin of the abscess be detected and if possible removed. The question had arisen as to whether this field belonged to the ophthalmologist or to the rhinologist. The proper person was one who combined both ophthalmology and rhinology in his practice, but this association was falling into disuse. He urged upon the ophthalmologist the desirability of a more intimate knowledge of the anatomy and diseases of the sinuses and insisted upon the treatment of these complications by ophthalmologists, or at least in their presence and with their counsel. He did not intend, however, that the rhinologist should be supplanted in the general treatment of sinusitis. The interest of the ophthalmic surgeon in this branch of surgery had already borne fruit, for the operation devised by Knapp for opening the frontal sinus accomplished all that the Killian procedure designed with less deformity and with conservation of the function of the superior oblique muscle. The involvement of the optic nerve as a consequence of ethmoidal and sphenoidal sinusitis might vary in degree from a simple œdema to an active retrobulbar inflammation. As a rule, the patient complained of some dimness of vision in

one eye, at times of vertigo, headache, and other head symptoms. The ophthalmoscope usually showed the unaffected eye to be normal, while in the fellow eye a slight veiling of the nerves at the edges was seen, with a dilatation of the retinal veins and a choking of the lymphatics around the central vessels. In cases of only slight involvement the patient was usually conscious of dimness in the affected eye. There was a normal vision for form, but a diminution of the light sense. A chief characteristic of neuritis due solely to sinus inflammation was its unilateral character, for although both nerves might be affected in the optic canal by inflammation of both sphenoidal sinuses, such cases were very rare. He referred at length to the changes in the optic nerve from sinusitis as set forth by Birch-Hirschfeld. The speaker and Dr. Packard had treated a number of cases in common, and Dr. Packard had summarized his observations from the standpoint of the rhinologist as follows: There were several classes into which cases of ophthalmic disease, resulting from intranasal trouble or disease of the accessory sinuses, might be divided. (1) Cases of direct extension of suppuration. These cases generally had a long history of intranasal or sinus trouble, as the escape of pus into the orbit was due to necrosis of the bony wall of the involved sinus. (2) There was a large class of cases in which eye symptoms occurred, and upon rhinological examination there was nothing to account for them except congestion of the sinuses, or possibly an accumulation of non-purulent secretion within them. (3) There was a very large class of cases which presented ophthalmic symptoms which were undoubtedly due to old sinus trouble, but in which no pus could be found at the time they were examined by the rhinologist. The history of these cases usually pointed to old catarrhal trouble. (4) There was a class of cases with a septal spur or deflection upon which the swollen turbinate impinged, and in which intraocular pain or other symptoms might result, which were relieved by a measure directed to enlarging the space between the turbinates and the septum. As indicating the frequency with which orbital inflammation was dependent upon disease of the accessory sinuses Birch-Hirschfeld found that of 684 cases of the former at least 409 depended upon one of the

sinuses. In almost all cases the condition was chronic or acute purulent sinusitis, which followed rhinitis, influenza, pneumonia, scarlet fever, and diphtheria, or after traumatism. The bacteriology of the eye was practically that of the accessory sinuses of the nose. An original sinusitis might heal, while the orbital condition to which it gave rise was progressive, as it could not find drainage.

Dr. EMIL GRUENING said that the relations between the eyes and the nose had interested him for a long time, because he often encountered cases showing ocular symptoms such as lachrymation and photophobia, in which local treatment of the eye and general treatment proved ineffective, while nasal treatment was beneficial. He had read a paper on this subject in 1886 which had been published in the *Medical Record*. The diseases of the accessory sinuses of the nose causing complications in the orbit came frequently under the observation of the ophthalmic surgeon. He was of the opinion that in many of these cases the intranasal treatment should be supplanted by operations from the orbit. In 1895 and 1896 he had written two articles on "Empyema of the ethmoidal cells and its operation from the orbit," and on "Orbital fistulæ due to ethmoidal disease." At that time he wrote that the good results obtained by surgical procedures from the orbit were so gratifying that it seemed advisable to substitute more frequently the orbital for the intranasal operations. The advantages of the orbital operation over the intranasal were the following: 1. The possibility of more direct inspection and exploration of the ethmoidal spaces. 2. The greater facility of removing granulations and polypi and carious bone. 3. The better chance of securing drainage by a counter-opening, *i. e.*, by perforating the floor of the ethmoidal body from above. The resulting scar was hardly visible and did not disfigure the face.

SECTION MEETING, MONDAY, JANUARY 18, 1909. DR. J. H. BELL, ACTING SECRETARY. DR. W. E. LAMBERT, PRESIDENT, IN THE CHAIR.

Present, thirty members.

Dr. LAMBERT was re-elected president and Dr. JOHN R. SHANNON was elected secretary.

Dr. E. GRUENING presented two specimens of **sarcoma of the ciliary body,** which had been mounted by Dr. Dixon.

Dr. W. B. MARPLE presented a specimen of **sarcoma of the ciliary body.**

Dr. MARPLE also presented a case of **foreign body in the vitreous.** Four weeks previously while pounding with a hammer and hatchet, a minute piece of iron flew into the patient's eye. He has a cataract with a small opening in the anterior capsule, through which soft, swollen lens matter protruded into the anterior chamber. Dr. Dixon localized the foreign body as lying 5*mm* to the nasal side of the vertical diameter of the cornea, and about 3½–4*mm* below the lower limbus. The patient was seated before the large Haab magnet, and the tip of the magnet was moved around all over the vicinity of the localization, also above and to either side, without producing any reaction whatever or eliciting any pain on the part of the patient. He was then laid on the table and, with a millimetre scale, careful measurements were made in the right eye 5*mm* to the left of the vertical diameter of the cornea and 3*mm* below the limbus, or on a tangent to the limbus continued to the nasal side. Exactly at this point, with the fine forceps and scissors, a small conjunctival flap was raised; then a Graefe knife was entered through the sclerotic, passing probably 6*mm* into the globe. It was then drawn out and rotated 90° and re-introduced so as to make a crucial incision. At the first application of the magnet, the opening was apparently a little too small, and with the knife it was enlarged slowly, just so as to permit the entrance of the tip of the magnet. The latter was then re-introduced not more than 5*mm* into the globe and withdrawn, and a very minute particle of iron was adherent to the magnet. The conjunctiva was then sutured over the opening and a bandage applied and the patient put to bed, atropin being previously instilled. December 30, 1908.—Bandage changed, very little reaction. Atropin instilled. One week subsequently linear section made with bent keratome, and considerable soft lens material expelled. January 11, 1909.—Patient discharged to be treated as an out-patient.

Dr. WOLFF reported an observation after needling for **secondary cataract.** After the extraction the patient had between

4 and 5 dioptries of astigmatism, against the rule. After needling, the astigmatism disappeared entirely and the patient had $\frac{20}{15}$ vision with +10 D. sph. He could not explain the disappearance of the astigmatism, unless it was due to the traction on the eye of the secondary membrane.

Dr. E. S. THOMSON read a paper on **The formation of secondary membranes after cataract extraction** which is published on pages 261–267 in this number.

In the discussion of Dr. Marple's case of extraction of a foreign particle from the vitreous, Dr. ARNOLD KNAPP thought it a very interesting case, and deemed Dr. Dixon's localization most excellent.

Dr. JOHNSON thought that a certain amount of encapsulation takes place and holds the foreign body in position. He thought it a very small piece of steel to penetrate the globe.

Dr. DIXON regards it a mistake, as a rule, to try to make an opening over the localization when using the Haab magnet when the foreign body has been in the eye some time. He advised also not to depend on an X-ray picture taken previously, for the use of the magnet, but to take another picture just before operating.

Commenting upon Dr. Wolff's case, Dr. A. KNAPP thought that it could be explained by means of the adhesion of the capsule to the corneal scar. Dr. E. S. THOMSON agreed with Dr. Knapp. Dr. LINN EMERSON had seen a case of a child with three dioptries of astigmatism. After using an atropin solution she came back having one dioptry of astigmatism. He was at a loss to explain the change.

In the discussion of Dr. Thomson's paper, Dr. GRUENING said there is no doubt that the inflammatory formation of the secondary cataract is due to cortex remaining between the anterior and posterior capsules. Though we irrigate, some of the lens cortex passes out in the solution and some remains, making a secondary cataract. The capsule thickens. From two to three weeks after extraction, he has opened the wound and irrigated this cortical matter, washing it out.

Dr. COBURN recalled Dr. Bates's experiments and they seemed to disagree with Dr. Thomson's idea. According to

Bates, these iritic cells have nothing to do with secondary cataract, but it is due entirely to fibrin. In 70% of the animals operated upon, the secondary cataract disappeared in three months, and in all in one year. In order to avoid secondary cataract, the fewer the instruments used in the anterior chamber the better. By using freely normal salt solution he did away with a great deal of fibrinous material. Dr. Coburn believed that iritis had nothing to do with the formation of the membrane.

MONDAY, FEBRUARY 15, 1909. DR. JOHN R. SHANNON, SECRETARY.
DR. W. E. LAMBERT, PRESIDENT, IN THE CHAIR.

Present, forty members.

Dr. E. GRUENING presented a specimen of **keratectasia e panno** which had been mounted by Dr. Dixon. The swelling, beautifully rounded, was 9*mm* in radius. There was no involvement of the iris; therefore it was not a staphyloma; and it was not brought about by excessive intraocular tension, which was shown by the fact that there was no depression of the optic-nerve head.

Dr. A. E. DAVIS showed a picture of **colloid degeneration of the retina.** The patient was a woman aged thirty-eight, first seen April, 1907. There was a history of failing vision for four years—that is to say, since the birth of her last child, which was born dead. There had been three healthy children before. There was a slow failure of vision, which was $\frac{20}{60}$ in each eye when the patient was first seen. The condition existed in both eyes. The fields were contracted for red and green, but not for white. Family history was uninteresting.

Dr. FRIDENBERG showed a specimen of a **round-celled sarcoma of the orbit** removed three years ago. There was no local recurrence, and no evidence of metastasis. Three years was, of course, a comparatively short time, but it meant a great deal to the patient. The operation was thorough, the peri-orbita having been peeled off back to the nerve entrance, and masses which had penetrated the floor of the orbit and partially filled the antrum and ethmoid cells were removed. The upper wall of the orbit was also broken through at one point, and the dura was exposed. The disfigurement

was not very marked. The interesting clinical features of the case were the slight immobility and exophthalmos, the tumor having started in the nerve sheath, and the preservation of good sight until a week or two before operation.

Dr. T. R. POOLEY reported a case of which he had made a former report to the Section, four or five months previously. The patient had been struck on the left side of the head with a blackjack. Exophthalmos was very marked, and there was evidently a communication between the carotid and the cavernous sinus. A bruit was heard over the eye. The retinal vessels were dilated and there were hemorrhages. Pressure was applied over the carotid, but was so uncomfortable that it had to be abandoned. Operation at the time was refused, but a month later the patient returned with the symptoms greatly aggravated, and complaining of slight symptoms on the opposite side. On June 4th common carotid was ligated. Pulsation of the eye disappeared at once and the exophthalmos disappeared to a marked degree. The patient was discharged one week after the operation. Ptosis had nearly disappeared. Vision was $\frac{20}{100}$. On August the 17th the disk was practically normal. The veins were slightly enlarged and tortuous and the vision was $\frac{20}{40}$.

Dr. W. B. MARPLE presented a case of **sarcoma of the ciliary region** which was demonstrated very clearly by the transilluminator, in spite of the cataractous lens.

The interesting point was that when the interior of the globe was transilluminated the shadow of the intraocular mass could be distinctly seen inside the eye even through the opaque lens, so brilliantly illuminated was the interior of the eye.

Dr. MARPLE also presented a case of **tuberculous iritis** with a drawing of the condition by Dr. Geo. W. Young.

The patient was a young colored girl, who had been treated for three weeks with hot applications, atropin, inunctions, and small doses of calomel. The eye got worse, numbers of what were apparently small miliary tubercles appearing on the surface of the iris. As a diagnostic aid, hypodermic injections of old tuberculin were begun; at first *1mg*, then three days later *1mg*. A rise of one-half degree in temperature was the only reaction, and the eye began to clear

surprisingly. Then *2mg*, followed by *3mg*, then *4mg* were given without any reaction; the eye whitened, and the vision, which was formerly movements of the hand, became $\frac{4}{10}$, the media clearing wonderfully.

Dr. MARTIN COHEN presented a case of **paralysis of the inferior oblique** of one eye, described on pages 282–283 in this number.

Dr. F. J. PARKER reported a case of **chronic lead poisoning** with a drawing of the fundus. The patient presented himself at the dispensary on February 2d. Pupils were equal and reacted to light. The retinal arteries were very small. There were severe neuro-retinitis, œdema, and hemorrhages in the entire field, and a large area of amyloid degeneration. In the left eye the condition was the same, but less marked. The blood pressure on admission was *225mm*. This had dropped to *155mm* on February 9th. There was a gradual diminution in the quantity of urine from 61 to 41 ounces in three days. There was no albumen in the urine except on February 8th. when it contained 5%. Patient died February 10th.

Dr. PARKER also reported a case of **ulcerative keratitis with iritis complicating tertian malaria.** F. N., aged twenty-two, entered the Presbyterian Hospital January 11th. Four days previously had occipital headache with slight chills and fever. The next day there was severe pain in the right eye, photophobia, and lachrymation. There was diffuse ulcerative keratitis over the entire cornea; injection of the ocular conjunctiva; the iris was dull in reflex and did not react to light. Temperature was normal; there was very severe pain and tenderness of the globe. Ordered atropin and hot applications. On January 14th, temperature arose to 104.4°; the eye was much worse. Blood examination showed the malaria parasite. Patient was put on quinin, five grains every four hours. This was followed by rapid improvement in the condition of the eye. Patient was discharged from the hospital January the 25th.

Dr. ARNOLD KNAPP gave a demonstration of **the occurrence of opsonins in the aqueous humor.**

Dr. C. W. CUTLER read a paper entitled **Suggestions as to the nature and treatment of gonorrhœal ophthalmia and phlyctenular keratitis.**

Dr. Cutler remarked that the two diseases which are most threatening to vision in childhood are gonorrhœal ophthalmia and phlyctenular keratitis. The milder cases of ophthalmia offer no serious problem. In the severer forms which may develop from apparently mild cases, argyrol and protargol are not always reliable and silver nitrate should be used. The chief problem is the protection of the cornea, especially the avoidance of injury during cleansing and inspection. Ulcers of the cornea are difficult to handle during the course of purulent ophthalmia, and it is rarely possible to limit them by direct applications of cautery or caustics. These measures may be tried, however, with care. In marasmic children, prognosis is bad as to life, as gonorrhœa in the mother lessens the vitality of the child, as Lobenstine has shown. The milder silver salts are useful in these children with low vitality, but in all sthenic cases, silver nitrate should be used. Protargol and argyrol have been used with success as prophylactics in measles and scarlet fever and corneal complications have been much less frequent in these diseases. Zur Nedden's views regarding astringents and the bactericidal action of the pathological secretion were discussed in this connection. In the treatment of ophthalmia, the question as to whether cold or heat should be used is of great importance and has not been sufficiently discussed. The thermal death point of the gonococcus is low and irrigations may be raised to 108° F., or even higher, without risk. The gonococcus is inhibited at a lower temperature and it seems feasible then to use large irrigations of hot saline solutions, or boric acid, or mild astringents during the acute stages of the disease, especially if the cornea is threatened, and to avoid the use of cold altogether. The perforated elevator of Callan has been found most useful for this purpose as it directs the current toward the fornix rather than against the cornea, as does the funnel which Kalt has used for irrigations with permanganate solution. The suspension of lactic acid bacillus prepared by Dr. Charles E. North has been used in a number of cases at the Foundling Hospital, and while it is too soon to claim definite results, it is at least harmless and has seemed to hasten recovery notably, not only in gonorrhœal ophthalmia but in acute conjunctivitis due to the diplobacillus and to the pneumococcus.

Phlyctenular diseases should be subdivided into at least two distinct forms as has been suggested by Morax and Axenfeld. The origin of the sub-epithelial phlyctenule is undoubtedly endogenous and the evidence that it is a result of tuberculous toxæmia is strong. Verhoeff attributed the condition to anaphylaxis, a previous infection having so sensitized the tissues that an insignificant re-infection or an exacerbation will produce results out of proportion to its own magnitude. In the same manner we may explain the reaction to tuberculin when the supposed focus is undiscoverable. Also it seems fair to assume that the hyper-sensitiveness may diminish with years, thus explaining the diminishing frequency of phlyctenules and scrofula in adults.

It is probable that as many eyes are damaged by phlyctenular keratitis as by gonorrhœa. Of course, the injury is not so severe, but an opacity or a facet in the pupillary zone is so common and is such a serious hindrance to higher economic usefulness that the attention of the general practitioner and of the public may well be drawn to these fleeting and apparently insignificant eruptions.

In the discussion of Dr. Pooley's case, Dr. WOODWARD stated that fifteen years ago he ligated the common carotid in a similar case. The symptoms disappeared. Five months later there was a relapse and all the symptoms returned. Pressure upon the vessels of the inner side of the orbit relieved the symptoms and he ligated the angular artery, the transversus nasi, and a mass of veins in that vicinity. This produced an absolute cure.

Dr. A. KNAPP had seen a case of traumatic pulsating exophthalmos with unusual symptoms. These were relieved by compression of the common carotid. The artery was tied, but after the operation, the patient complained that the bruit was still present. On compression of the neck it disappeared.

Dr. LAMBERT some years ago showed a case of the same condition. The artery was ligated by Dr. Wyeth, the exophthalmos subsided, and the hemorrhages which had been the prominent symptom stopped. The patient disappeared.

Dr. GRUENING had seen a similar case. Both eyes were

affected and both were blind. The symptoms disappeared on pressure of one common carotid. The artery was tied and the patient lived for eight years perfectly well. The sight returned. Death was due to pneumonia.

Dr. POOLEY said that in sixty-three cases collected by Dr. Wyeth all but four had recovered after tying the common carotid artery.

In the discussion of Dr. Parker's case of keratitis and iritis complicating tertian malaria, Dr. GRUENING asked if the improvement in the condition of the eye seemed to Dr. Parker to be due to the general medication. Dr. PARKER answered in the affirmative.

In the discussion of Dr. Marple's case of tuberculous iritis, Dr. KNAPP said that notwithstanding that there was no rise of temperature the local condition of the eye improved under tuberculin. This is interesting. Tuberculin being a specific, this must be regarded as evidence that the growth was tuberculous.

Dr. CUTLER had seen a similar case, though of interstitial keratitis, which had been treated as specific without effect. Patient also had an ulcer of the fauces. He was given small doses of tuberculin, and improved very rapidly.

Dr. DAVIS had seen a case diagnosed as tuberculous iritis, but there was no treatment and the patient recovered with $\frac{20}{15}$ vision. Why we should conclude that tuberculin is a specific, he was at a loss to know. He did not think the point established.

Dr. CUTLER remarked that twelve or fifteen years ago Leber had made this observation, that some tuberculous cases do well without treatment.

Dr. A. KNAPP observed that he did not consider tuberculin a specific in the sense that it would cure all tuberculous cases, but that it produces specific anti-bodies which act upon tuberculous foci.

Dr. MARPLE remarked that this case had been treated as specific for four weeks without effect.

In the discussion of Dr. Cutler's paper, Dr. DUANE said heat of 106–108 degrees could be borne by the cornea, and possibly a much higher temperature. If the water be dropped

gradually on the cornea it may begin at 110 degrees and go as high as 120 degrees without danger. In old iritis and cyclitis this is very beneficial. The death point of the gonococcus being low, he thought that gonorrhœal ophthalmia offered a promising field for these hot-water applications. In phlyctenular keratitis, treatment should be directed towards the raising of the child's vitality by proper hygiene and diet.

Dr. P. FRIDENBERG questioned whether it would be wise to abandon the traditional treatment in these cases, which are so serious, without careful experimental investigation beforehand.

Dr. C. E. NORTH said that it is premature to make any definite claims for the lactic acid treatment. He had received a number of reports of cases of gonorrhœal ophthalmia which had improved under the treatment. But they might have done as well under other treatment. He had, however, just received the report of a case in which the sight was impaired by an ulcer of the cornea, and had been in that condition for three years in spite of all other treatment. Under the lactic acid treatment the sight had been restored. The lactic acid suspension was being used in a number of other conditions. It seemed to contain some other active principle than the acid.

Dr. W. E. LAMBERT said that he had had a case of gonorrhœal ophthalmia in which argyrol had failed, while constant irrigation with nitrate of silver had cured it.

Dr. C. W. CUTLER thought that a temperature above 108 degrees would be risky in the eyes, especially of children with weak corneal epithelium. Concerning the lactic acid treatment, he warned against undue enthusiasm. He merely wanted his colleagues to try the remedy and report the results. He thought well of it in some seventeen cases in which he had tried it; it certainly seemed to add to the efficacy of the routine treatment, which he had not yet abandoned.

The meeting adjourned.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FIRST AND SECOND QUARTERS OF THE YEAR 1908.

By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the assistance of Prof. A. ALLING, New Haven; Prof. E. BERGER, Paris; Prof. CIRINCIONE, Genoa; Dr. DALÉN, Stockholm; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Mr. C. DEVEREUX MARSHALL, London; Dr. H. MEYER, Brandenburg; Dr. P. VON MITTELSTÄDT, Metz; Dr. H. SCHULZ, Berlin; Prof. DA GAMA PINTO, Lisbon; and others.

Translated by Dr. PERCY FRIDENBERG, New York.

Sections I.–III. Reviewed by Dr. HORSTMANN, Berlin.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

1. RUNGE, E. *Gynæcology and obstetrics in relation to ophthalmology.* Leipsic, Barth, 1908.

2. MONTHUS, ALB. *Stereoscopic plates for oculistic demonstration.* Paris, Masson, 1908.

3. LANGE. **Treatment of injuries of the eye.** *Vossius' Abhandl.*, vol. vii., No. 5.

4. KOMOTO. **Eye diseases in Japan.** *Centralbl. f. prakt. Augenheilkunde*, xxxii., pp. 261–289.

5. KOMOTO. **History of blindness in Japan.** *Klin. Monatsbl. f. Augenheilkunde*, xlvi., ii., 3.

6. QUIRSFELD, E. **Photometric examinations of schools.** *Prager med. Wochenschrift*, 1908, 13.

7. ROSMANIT. **Color vision tests in railway and marine service.** *Wiener klin. Wochenschrift*, 1908, No. 13.

8. SCHOLTZ. **Causes and distribution of blindness in Hungary.** *Zeitschrift f. Augenheilkunde*, xix., p. 409.

9. ROSENFELD, L. M. **The question of eye disease among the Jews.** *Jewreisky Med. Goloss.*, 1908, No. 1.

10. HALTENHOFF. **Economic damage from ocular lesions.** *Rev. Suisse d. Accid. du Trav.*, ii., June, 1908.

11. Wassinsinsky, A. **On intentional mutilation of the eyes.** *Westnik Ophthalm.*, 1908, No. 3.

Runge (1, **Gynæcology and obstetrics in relation to ophthalmology**) discusses the relations of gynæcology and obstetrics to ophthalmology, describing the disturbances of vision in menstruation, puberty, and climacteric; the ocular lesions associated with Basedow's disease, chlorosis, masturbation, and with infectious processes and hemorrhages of the genital tract. Injuries to the eye of the child intra partum, and ophthalmia neonatorum, are also described.

The stereoscopic plates of Monthus (2, **Stereoscopic plates for oculistic demonstration**) are for use of students in recalling specimens, cases, and operations seen in the various courses. This set includes tarsorrhaphy, transplantation of the lid margin, and extirpation of the lachrymal sac. Berger.

Lange (3, **Treatment of injuries of the eye**) gives a concise treatise on the management of injuries of the eyes. Recent wounds are to be considered as infected and must be washed out with oxy-cyanate of mercury, 1:3000, and protected by a bandage.

Komoto (4, **Eye diseases in Japan**) notes the frequency of trachoma, of follicular conjunctivitis, and of syphilitic disease of the eyes, in Japan.

Komoto (5, **History of blindness in Japan**) gives an interesting account of the blind in Japan. From the 9th century until the middle of the 19th century they formed a caste with special privileges, and occupied themselves with music, acupuncture, and massage, in which arts they became masters.

Quirsfeld (6, **Photometric examinations of schools**) advises in construction of schoolhouses to have the rooms toward the north, northeast, or northwest. The depth of the room must not exceed twice the height of the windows. The window frames must be narrow. Shades must be light gray and translucent.

Rosmanit (7, **Color vision tests in railway and marine service**) urges the exclusion, from railway and marine service, of all anomalous trichromates. Nagel's plates and his anomaloscope are the only reliable apparatus for testing these cases.

Scholtz (8, **Causes and distribution of blindness in Hun-**

gary) finds that of 1056 cases of blindness in Hungary, 267 were due to disease of the cornea, 190 to uvea, 66 to retina, 271 to optic nerve and tracts, 170 to glaucoma, and 92 to injuries. 361 were absolutely, 207 possibly, preventable, and only 448 were inevitable.

ROSENFELD (9, **The question of eye disease among the Jews**) thinks the commoner forms of eye diseases in Israelites are not racial, but due to poor hygienic or industrial conditions. Syphilis is comparatively rare. Chronic blepharitis, due to anæmia, tuberculosis, scrofula, is common. Amaurotic family idiocy is racial and more common than is usually thought.

HIRSCHMANN.

HALTENHOFF (10, **Economic damage from ocular lesions**) estimates the loss of an eye as equivalent to a reduction of an average of 25% of earning ability. Vision less than 0.1 is practically useless. For most occupations binocular vision requires V=0.7 to 0.75 in each eye.

WASSINSINSKY (11, **On intentional mutilation of the eyes**) describes the self-inflicted injuries of the eyes observed in recruits. Caustics such as lime, ammonia, soap, tobacco, were frequently introduced into the conjunctival sac. Corneal opacities, always in the right eye, were produced by a pencil dipped in acid. Animal experiment showed that only yellow ochre and nitrate of silver stick produced a lasting corneal opacity.

HIRSCHMANN.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND TREATMENT.

12. TSCHIRKOWSKY. **Influence of toxins on the conjunctiva.** *Graefe's Arch. f. Ophth.*, lxviii., No. 1, p. 77.

13. ABE, NAKAO. **Experimental studies on panophthalmitis.** *Beitr. f. Augenheilkunde*, lxx., p. 554.

14. WESSELY, K. **Experimental studies on intraocular tension.** *Arch. f. Augenheilkunde*, lx., No. 1, p. 3.

15. ULBRICH, H. **Clinical study of tension in anterior and posterior chamber.** *Ibid.*, lix., No. 4, p. 283.

16. HORN. **Adaptation to darkness in various diseases of the fundus.** *Ibid.*, No. 4, p. 389.

17. VOGT. **Effect of ultraviolet rays on the eye.** *Ibid.*, No. 1, p. 91.

18. WIRTZ. **Panophthalmitis caused by tetanus bacillus after injury.** *Klin. Monatsbl. f. Augenheilkunde*, xlvi., No. 1, p. 6.

19. KRAUSS. **Streptococcus infection of eye and adnexa in impetigo.** *Zeitschrift f. Augenheilkunde*, xix., p. 123.

20. SCHOENING. **Amaurosis due to felix mas.** *Ibid.*, p. 233.
21. HERFORD. **Ocular disturbances due to atoxyl.** *Deutsche med. Wochenschrift*, 1908, No. 18.
22. EBERHARDT, W. **Case of belladonna poisoning.** *Ophth. Record*, Jan., 1908.
23. ZUR NEDDEN. **Significance of opsonins for the eye.** *Zeitschrift f. Augenheilkunde*, xix., No. 4, p. 233.
24. LEVIS, J. B. **Blindness following injection of protargol into lachrymal sac.** *Ophth. Record*, 1908, p. 284.
25. ADAM. **Injury to the eye from ophthalmo-reaction.** *Med. Klinik*, 1908, No. 6.
26. v. HIPPEL, A. **Serum therapy of the eye.** *Deutsche med. Wochenschrift*, 1908, No. 27.
27. BIRCH-HIRSCHFELD. **Action of X-rays on the eye.** *Klin. Monatsbl. f. Augenheilkunde*, xliv., No. 2
28. LOEWENSTEIN, A. **Regional anæsthesia of the orbit.** *Ibid.*, xlvi., No. 1, p. 3.
29. SPIEGEL. **Consistency of paraffin used for artificial prosthesis.** *Berlin. klin. Wochenschrift*, 1908, No. 9.
30. FRENKEL, H. **Therapeutic value of subconjunctival injections of sterilized air.** *Ann. d' ocul.*, cxxxix., p. 182.
31. KUBOTA, G. **Treatment of eye disease with incandescent light.** *Inaug.-Diss.*, Munich, 1908.
32. HERTZEL. **Examination of the fundus by transmitted light.** *Berlin. klin. Wochenschrift*, 1908, No. 4.
33. FRIDENBERG. **Notes on transillumination of the eye.** ARCH. OF OPHTH., xxxvii., No. 3, p. 302.
34. JOSEPH, H. **Detection and measurement of central scotoma by stereoscope.** *Arch. d'ophtalm.*, xxviii., p. 98.
35. PENDRED, V. **Case of mirror-writing.** *Lancet*, Jan. 4, 1908.
36. AYRES, S. C. **Use of cheap hammers as a factor in penetrating wounds of the eye.** *Amer. Journ. of Ophth.*, May, 1908.
37. BUTLER, T. HARRISON. **Calmette's ophthalmo-reaction.** *British Medical Journal*, April 18, 1908.
38. LECKY, H. C. **Calmette's reaction.** *British Medical Journal*, March 28, 1908.
39. WOODCOCK, H. DE CARLE. **The ophthalmo-reaction.** *British Medical Journal*, March 28, 1908.
40. STEPHENS, H. G. R. **Calmette's ophthalmo-reaction.** *British Medical Journal*, March 28, 1908.
41. DENIG, R. **Paracentesis of the anterior chamber in inflammatory processes of the anterior uveal tract.** *Ophth. Rec.*, March, 1908.

TSCHIRKOWSKY (12, **Influence of toxins on the conjunctiva**) found that toxins instilled into the conjunctival sac would eventually interfere with the integrity of the normal epithelium. Necrosis may be caused by chemicals contained in the filtrates.

ABE, NAKAO (13, **Experimental studies on panophthalmitis**) found that all but 6 of 23 species of bacteria, mostly saprophytes, produced panophthalmitis. Bacillus subtilis is the most common but not the exclusive cause.

WESSELY (14, **Experimental studies on intraocular tension**) describes manometric measurements with a graphic method. Intraocular tension varies with blood pressure and with minor changes such as pulse and respiratory oscillations. Irritation of the sympathetic reduces tension. Congestive hyperæmia produces marked increase of tension.

Ulbrich (15, **Clinical study of tension in anterior and posterior chamber**) reports a case of oval coloboma of the iris in a woman of thirty. The opening was covered by a thin membrane which was bellied backward or forward on movement of the lids, accommodation, pressure on the cornea, serving as a delicate indicator for variations of pressure in the anterior and posterior chamber, and proving the correctness of the hypothesis of a physiological pupillary seclusion.

HORN (16, **Adaptation to darkness in various diseases of the fundus**) finds that even high degrees of myopia do not interfere with adaptation unless complicated by disturbances of nutrition, which may not always be detected by ophthalmoscopic examination. Hemeralopia due to chronic alcoholism, nephritis, diabetes without fundus changes, atypical retinitis pigmentosa, heredito-specific chorio-retinitis, and tabetic atrophy were all associated with marked disturbance of adaptation.

VOGT (17, **Effect of ultraviolet rays on the eye**) recommends a lead-flint glass to absorb ultraviolet rays, which when concentrated may cause conjunctivitis, keratitis, iritis, lenticular opacities, and chorio-retinal affections.

WIRTZ (18, **Panophthalmitis caused by tetanus bacillus after injury**) reports a case of panophthalmitis in a boy of 1½ years following a blow with a whip. Tetanus bacilli were found in the exuding pus, and antitoxin was injected. The eye was enucleated and found to contain besides B. tetanus, the B. subtilis, B. mycoides, B. proteus vulgaris, B. coli commune, and staphylococcus pyogenes aureus.

KRAUSS (19, **Streptococcus infection of eye and adnexa in impetigo**) reports a case of pustulous exanthema of face

and hands in a male adult. Several pustules appeared on the lower lid margin and by contact produced a similar affection of the conjunctiva. Lymphadenitis also developed, with severe dacryocystitis, and an ulcer of the cornea. Streptococci were found as the cause.

SCHOENING (20, **Amaurosis due to felix mas**) reports the development of amaurosis in a robust adult male after two doses of extract of male fern, 10 grammes each. Narrowing of retinal arteries, and venous stasis, with peculiar striate œdema of the retina developed. After fourteen days vision had risen to perception of light in the periphery.

HERFORD (21, **Ocular disturbances due to atoxyl**) reports two cases of blindness due to atoxyl. In a third case, injections of this drug caused retinal hemorrhages which were absorbed when it was discontinued. Doses of more than 5.0 grammes are dangerous.

EBERHARDT'S (22, **Case of belladonna poisoning**) case of atropin poisoning is interesting as there were marked systemic symptoms after repeated instillation of atropin and homatropin, and complete paralysis of accommodation, but no dilatation of the pupil. ALLING.

ZUR NEDDEN (23, **Significance of opsonins for the eye**) found that opsonins from the blood enter the secretion of the conjunctiva and the intraocular fluids just as the bactericidal substances do. Opsonins generally appear in the conjunctiva when it becomes inflamed. The tears never show any opsonic content, even in chronic disease of the lachrymal sac. Subconjunctival injection of salt solution increases the opsonins in the anterior chamber, while congestive hyperæmia seems without any effect.

LEVIS (24, **Blindness following injection of protargol into lachrymal sac**) injected 1 *ccm* of a 25% protargol solution into a purulent lachrymal sac. Orbital cellulitis followed, with hyperæmia of the retina and optic nerve. Atrophy came on, and sight was completely lost. An incision into the orbit below the globe failed to evacuate fluid. This case of rupture of the sac and infection of the orbit is a warning against forcible syringing. ALLING.

ADAM (25, **Injury to the eye from ophthalmo-reaction**) notes that the instillation of tuberculin may be injurious not only

by the reaction (*allergie*) which it causes in the tissues, but by toxic or infectious action, especially if there is existing ocular disease, and in scrofulous children. It also increases the susceptibility of the conjunctiva to tuberculin.

v. HIPPEL (26, **Serum therapy of the eye**) used Deutschmann's serum in a case of severe plastic iritis and in ulcus serpens, where it seemed to render the application of the galvano-cautery unnecessary, with good results, if used frequently and injected in large enough doses to suit the individual case. It does well in non-tuberculous serous iritis.

BIRCH-HIRSCHFELD (27, **Action of X-rays on the eye**) observed five cases of conjunctival irritation and pericentral color scotoma after prolonged exposure to the mercury vapor lamp which is rich in ultraviolet rays. He advises lenses of high absorbing flint glass.

LOEWENSTEIN (28, **Regional anæsthesia of the orbit**) produces regional anæsthesia of the orbit for enucleation or exenteration by injecting 1% cocain into the ciliary ganglion and the nerve trunks at the apex of the orbit. The needle is carried along the outer wall of the orbit to a depth of $4\frac{1}{2}$ *cm.*

SPIEGEL (29, **Consistency of paraffin used for artificial prosthesis**) notes the danger of embolism and inflammation and warns against the use of soft paraffin for injections. Any paraffin which on pressure between the fingers soon feels moist must be rejected for this purpose.

FRENKEL (30, **Therapeutic value of subconjunctival injections of sterilized air**) notes good effects of subconjunctival injections of sterilized air in episcleritis, superficial keratitis, phlyctenules, and corneal abscess and ulcer. Deep keratitis was not affected. BERGER.

KUBOTA (31, **Treatment of eye disease with incandescent light**) reports marked improvement in recent and old cases of parenchymatous keratitis treated with incandescent light.

HERTZEL (32, **Examination of the fundus by transmitted light**) uses a light source of more than 50 c. p. with a cooling attachment, which is placed in the mouth and the face up to the eyes covered with a black cloth. The bright red fundus can be examined in the upright or inverted image, and any pathological changes in the wall of the globe or in the orbit detected.

FRIDENBERG (33, **Notes on transillumination of the eye**) examines the anterior portion of the fundus by a combined method, using the ophthalmoscope, and at the same time applying the Sachs transilluminator external to the point to be seen. The fundus can be seen as far forward as the ciliary processes. TREUTLER.

JOSEPH (34, **Detection and measurement of central scotoma by stereoscope**) recommends the stereoscope of Pigeon for the detection of small central scotomata according to Hatz. Even large defects can be accurately measured with this instrument. BERGER.

PENDRED (35, **Case of mirror-writing**) reports a case of mirror-writing in a child of six.

AYRES (36, **Use of cheap hammers as a factor in penetrating wounds of the eye**) shows that the tools bought by most mechanics are merely surface hardened, so that in use small particles break off much more easily than from good steel. ALLING.

BUTLER (37, **Calmette's ophthalmo-reaction**). After some months' experience with the ophthalmo-tuberculin test the author decided that it was an aid to diagnosis, but by no means a definite test; many non-tuberculous cases reacted, and some certainly tuberculous did not. He compares it to the Widal typhoid reaction which is not quite infallible in its results. T. HARRISON BUTLER.

LECKY (38, **Calmette's reaction**) has collected all the published statistics. Of 491 cases of definite tuberculosis, 463 (94.3%) gave a positive reaction. Of 610 cases of people with no evidence of tuberculosis, 563 (92.3%) showed a negative result. T. HARRISON BUTLER.

WOODCOCK (39, **The ophthalmo-reaction**) has tried the ophthalmo-tuberculin reaction in 200 cases. Those with surgical tuberculosis reacted violently, and the inflammation was prolonged. Eyes which were diseased suffered from a severe conjunctivitis, and in some cases the patient complained for ten days. Patients with ordinary eye complaints reacted violently, and there was no other evidence of tubercle. Many of the author's friends in robust health reacted. Woodcock is more inclined to favor the blister test. T. HARRISON BUTLER.

STEPHENS (40, **Calmette's ophthalmo-reaction**). At the Crossley Sanatorium for Phthisis only two patients out of 106 trials failed to react after the 1st, 2d, or 3d instillation of Calmette's serum. In 83 of these tubercle bacilli were present in the sputum. T. HARRISON BUTLER.

DENIG (41, **Paracentesis of the anterior chamber in inflammatory processes of the anterior uveal tract**) has treated twelve cases by repeated punctures, including iritis, cyclitis, interstitial keratitis, chorio-retinitis, and diabetic neuro-retinitis. In the majority of cases improvement followed, especially in the lessening of the pain. He uses a narrow keratome and in a few minutes reopens the wound. ALLING.

III.—MEDICAMENTS AND INSTRUMENTS.

42. BOK, E. **New ocular remedies.** *Allg. Wiener med. Ztg.*, 1908, No. 35.

43. RUBERT, J. **Effect of adrenalin on intraocular tension.** *Westn. Ophth.*, 1908, No. 1.

44. AGABABOW. **Lipogenin in ophthalmic practice.** *Russky Wratsch*, 1908, No. 12.

45. REBER. **Comparative potency of hyoscin and scopolamin hydrobromid in refraction work.** *Journ. Amer. Med. Assn.*, April 25, 1908.

46. ARLT. **The deep action of dionin, again.** *Wochenschr. f. Hyg. u. Ther. d. Auges*, 1908, No. 25.

47. GIFFORD, H. **On the possible use of atoxyl and other preparations of arsenic in sympathetic ophthalmia, trachoma, and some syphilitic affections of the eye—A suggestion.** *Ophth. Rec.*, March, 1908.

48. BATTEN, RAYNER D. **A report of the comparative action of homatropin methyl bromide and homatropin bromide as a mydriatic.** *Ophthalmic Review*, January, 1908.

49. WÜRDEMANN, H. V. **Diaphanoscopy in glaucoma.** *Ophth. Rec.*, March, 1908.

50. WÜRDEMANN, H. V. **Additional observations on the use of the transilluminator (the Würdemann lamp).** *Ophth. Record*, April, 1908.

51. CARSON, R. L. **An illuminated eye-spud and knife-needle.** *Journ. Amer. Med. Assn.*, May 9, 1908.

52. BLACK, N. M. **Method of illuminating test-type charts with artificial light.** *Ophth. Record*, May, 1908.

BOK (42, **New ocular remedies**) is not satisfied with the anæsthetic action of acoin, finds that airol cannot take the place of iodoform, and recommends adrenalin. Holocain is a good substitute for cocain. Dionin must be used cau-

tiously. Copper citrate is excellent in trachoma. Scopolamin (1: 1000) is a reliable mydriatic. Antisclerosin is useful in retinal hemorrhages, aspirin as a succedaneum for salicylate of soda.

RUBERT (43, **Effect of adrenalin on intraocular tension**) notes that adrenalin instillations cause a diminution of intraocular pressure, followed by a rise, and a second fall. In tendency to glaucoma, adrenalin may bring on an attack. The effect of adrenalin may be explained by its influence on ocular circulation. HIRSCHMANN.

AGABABOW (44, **Lipogenin in ophthalmic practice**) prefers oily solutions of the alkaloids. Olive oil or lipogenin may be used. Iodoform dissolved in the latter medium loses its odor. HIRSCHMANN.

REBER (45, **Comparative potency of hyoscin and scopolamin hydrobromi in refraction work**) studied the effect of equally strong solutions of hyoscin and scopolamin on pupil and accommodation. The mydriatic action is about the same, but hyoscin is 50% more effective as a cycloplegic. In 2000 refraction tests he used $\frac{1}{16}$% hyoscin in combination with $\frac{1}{8}$% cocain and had no toxic effect in any instance. In about 2% of the cases there was, however, a marked physiological action, viz.: flushing of the face, rapid pulse, and slight vertigo. ALLING.

ARLT (46, **The deep action of dionin, again**) reports a case of hemorrhage at the macula which disappeared after the use of dionin.

GIFFORD'S (47, **On the possible use of atoxyl and other preparations of arsenic in sympathetic ophthalmia, trachoma, and some syphilitic affections of the eye—A suggestion**) attention was attracted to atoxyl, a combination of arsenic and anilin, by its affinity for pathogenic protozoa. The fact that it has been suggested that sympathetic ophthalmia is caused by a protozoön warranted him in trying the treatment. There was prompt improvement, although his results were somewhat vitiated by the fact that sodium salicylate and mercury were being given in large doses at the same time. For similar reasons he suggests its use in trachoma and syphilis. Atoxyl has been known to produce blindness if given in large doses. ALLING.

BATTEN (48, **A report of the comparative action of homatropin methyl bromide and homatropin bromide as a mydriatic**). Homatropin methyl bromide in 2% solution produces its physiological effect almost as soon as the usual salt, but has the advantage that the eye returns to normal in 2–4 hours. The inconvenience caused to the patient by the methyl salt is thus much less than that caused by homatropin bromide. T. HARRISON BUTLER.

According to WÜRDEMANN (49, **Diaphanoscopy in glaucoma**) diaphanoscopy is a valuable corroborative measure in glaucoma. He finds a narrow circumlental space which is easily estimated by this method and predisposes to increased ocular tension and thus glaucoma may readily follow a small degree of swelling or congestion of the root of the iris. ALLING.

WÜRDEMANN (50, **Additional observations on the use of the transilluminator—the Würdemann lamp**) uses the lamp in the detection of minute lesions in the cornea, *e. g.*, foreign bodies, abrasions, and small maculæ. He also finds it useful for illumination in discissions of secondary cataract, as well as for the study of iris attachments, in determining the site for operations, etc. ALLING.

CARSON (51, **An illuminated eye-spud and knife-needle**) has attached a small electric lamp to the handle of a spud or needle to throw light on a foreign body or a membrane while operating. ALLING.

Of sixty replies to letters to American ophthalmologists inquiring whether they preferred transmitted or reflected light, BLACK (52, **Method of illuminating test-type charts with artificial light**) found that 18 gave preference to reflected light, 9 to transmitted, 3 found no difference, 5 used daylight, and 25 had had no experience with transmitted light. He then points out the desirability of using the latter method of illumination. ALLING.

IV.—**Die Sehstörungen bei Schussverletzungen der Kortikalen Sehsphäre** (Disturbances of Vision in Gun-shot Wounds of the Cortical Visual Centre). From observations on the wounded in recent Japanese wars by Dr. TATSUJI INOUYE, Tokio, with 39 figures in the text and 2 plates. Leipzig: W. Engelmann, 1909.

The author gives a description of his experiences during the late Japanese wars, the revolt of Boxers in 1900 and the Russo-Japanese war, 1904–1905, where he served in capacity of a Japanese army-surgeon. Examination by means of dissection showed that the injury of the cranium caused by modern projectiles of small calibre resembles a straight line, connecting both foramina of the projectile's entry and exit. The clinical symptoms proved that the cerebral injury is in immediate proximity of the wound of the brain. Identical injuries are produced by grazing shots of small-calibre projectiles. Quite different injuries are sustained from fragments of grenades and shrapnell, still, if we know the projectile's entry and exit, an approximate diagnosis, as to the parts of the brain injured, can be made. To facilitate diagnosis, Inouye constructed a device which he calls "craniocoördinometer." With the aid of the "craniocoördinometer" he constructed a "Japanese skull model," which is a combination of various Japanese crania, and a "brain model," in which the exact location of the calcarine fissure, parieto-occipital fissure, optic radiation, etc., is given. Under such circumstances the injuries sustained by the brain can be ascertained with comparative minuteness, for by appropriate measuring, the location of the injury can be transferred to the "skull model" and to the "brain model," and the injured

part of the brain can be easily found by simple mathematics. Of course it must be taken into consideration that the calculation is only approximate and that the measurements vary according to different individuals; but that these calculations generally tally is plainly shown in the histories and post-mortem records.

The number of wounded in the revolt of the Boxers in 1900 was 1185, whereas the wounded in the Russo-Japanese war amounted to 220,812. The 28 cases enumerated herein were selected from 80,000 wounded. These cases included 4 cases of right- or left-sided hemianopsia, 7 cases of inferior hemianopsia, 5 cases of quadrant hemianopsia, 5 cases of pericentral or paracentral scotoma, and 8 other cases, giving the detailed history of 29 cases; 28 of them had been injured in war. These give the following interesting results:

The injuries have been caused from a distance of 4–2000 metres, in 25 cases by small-calibre projectiles, in 3 cases by splinters of grenades or shrapnell, and in one case by some unknown object. All patients became unconscious after being injured, the unconsciousness lasting from one-half hour to sixteen days. Motility was not disturbed, aside from such cases where the centres of motion were injured or where the disturbance of motion was due to the frequently occurring hysteria. A very characteristic feature was the abnormal declination of the head, especially in cases of inferior hemianopsia and in concentrical contraction of the field of vision. The majority of patients complained of severe headache; the pain manifested itself mainly about the boundaries of the wound, thence radiating in the various parts of the head. Most patients experienced neurasthenic symptoms such as weakening of memory, dizziness, insomnia, etc. In most cases, immediately after the injury, cortical blindness set in, which, however, disappeared within a few days.

Eye.—The eyelids, conjunctiva, cornea, as well as the media, are normal. The fundus is normal in 23 cases, but shows optic neuritis in 4 cases, and atrophy of the optic nerve in 2 cases. Pupils are normal with the exception of 3 cases of mild anisocoria. Light reaction barring one exception is normal. The motions of the eyes were in all instances normal, of course their promptness of action being subject to the

influence of the field of vision and sight. Disturbed motility was observed in only one instance where the left angular gyrus was injured, thereby also diminishing accommodation and convergence. There was only one case of disturbance of the distance-judging (*Tiefenwahrnemung*), where the left angular gyrus was injured. Almost every patient complained of scotoma scintillans. The latter generally manifested itself in the form of attacks lasting from a few hours up to several days, and was in most cases associated with peculiar and individually differently described deep-seated pain. This sort of pain would very well deserve to be styled "optic neuralgia"; according to Inouye the optic nerve on certain unusual irritation may act as a conductor of the sensation of pain. The "optic neuralgia" manifested itself bilaterally, in general lasting a few hours or several days, associated with headache and scotoma scintillans; the attack increased from eye-strain or very bright light, was changeable with the change of weather, mostly improving within a few months. The vision was considerably diminished after the patient regained consciousness; in 13 cases there was absolutely no perception of light, in 5 cases merely perception of light, and in 10 cases exceedingly decreased vision. The visual capacity improved as follows: Of 58 eyes, in 20 to $\frac{6}{6}$; in 25 to $\frac{6}{20}$; and 13 were able to count fingers at a distance of several metres. The erstwhile blindness in all of these cases was thus a cortical blindness, and the regaining of vision was always in proportion to the injury of the visual centre.

Field of vision.—Particular stress was laid upon the examination of the field of vision, which was performed above, above-in, and above-out by lifted eyelids, so that it comprised the so-called absolute field of vision which exceeds the boundary of the usual field of vision by about 10°. Among the enumerated 28 cases there were 4 distinct and 2 indistinct cases of right- or left-sided hemianopsia, 4 distinct and 1 indistinct case of inferior hemianopsia, 3 distinct and 1 indistinct case of quadrant hemianopsia, 1 small distinct and 2 probable cases of pericentral scotoma, 1 large distinct inferior pericentral scotoma, 1 indistinct superior pericentral scotoma, 2 not homonymous defects with atrophy of the optic nerve, 2 markedly and 2 partially concentric contractions of the

field of vision, and furthermore 1 multiple ring scotoma. In 3 cases of the above-mentioned 4 distinct right- or left-sided hemianopsia, according to the calculations the injury lay in one optic radiation, whereas in the fourth case the dissection disclosed an abscess the size of a goose egg in the proximity of the pole of the left occipital lobe; thus the extreme hind section of the optic radiation was injured. In the 4 cases of inferior hemianopsia the visual sphere was bilaterally injured supero-posteriorly, thus the injury is located on both sides above the calcarine fissure. Applied mathematics indicated the injury of the visual sphere or the optic radiation of one side, superiorly, in all 4 of the above-enumerated cases of inferior quadrant hemianopsia. According to calculation in the case of superior quadrant hemianopsia the anterior part of the optic radiation was injured inferiorly. In cases of pericentral scotoma applied mathematics showed that the visual sphere sustained injury posteriorly. In cases of inferior paracentral scotoma and inferior pericentral scotoma the visual sphere was injured from above-back, whereas in a case of superior pericentral scotoma the right visual centre was injured from below. In a single case where multiple scotomata were present the left hemisphere of the cerebellum was the place of injury. In each case where the location of the injury is in the visual area, optic radiation, or in the immediate proximity of the latter there is a concentrically contracted field of vision present, but the direct injury of the visual sphere or optic radiation has no influence upon the concentric contraction of the field of vision. Said scotomata in each instance proved to be negative, except that in one case where the patient did not lose consciousness a positive scotoma was perceptible, which, however, later turned negative.

The author concludes that the visual area mentioned by Monakow has a much larger scope than the calcarine area and contains the cuneus, the lateral occipital gyri, and the posterior part of the angular gyrus. From a functional point of view it consists of two parts; 1. The main visual area; 2. The subordinate visual area. The main visual area is that particular part which we have so far styled as visual area proper and which corresponds with the cortex of the calcarine

fissure and extends about 1*cm* around the calcarine fissure upon the medial surface of the occipital lobe—here the perceptions of the retina are sharply projected. The subordinate visual sphere is the remaining part, where there is certain projection though not as keen. As far as the corresponding cortical area of the macula is concerned, the author expresses his belief that it must be located in the posterior part of the calcarine fissure, as in all cases where the main visual sphere was injured in the posterior part a pericentral scotoma was perceptible, leaving intact the peripheral parts of the field of vision. The deeper the injury of the main visual sphere the larger the scotoma, viz.: the more tendency to extend from the centre towards the periphery.

A lesion located on the floor of the calcarine fissure causes a horizontal scotoma in the field of vision, whereas a lesion above or below the calcarine fissure causes a scotoma in the inferior or superior quadrant. Thus the meridian lines of the field of vision have the following position in the main visual centre: the meridian lines of the left half of the field of vision, viz., those turning upward, upward-left, left, downward-left, and downward, are situated in gradual order in descending line in the left main visual centre; perfectly identical is the situation of the meridian lines of the right half of the field of vision in the right main visual centre.

ERVIN TÖRÖK.

V.—**Manuel Pratique du Strabisme** (Practical Manual of Strabismus). By Dr. RENÉ ONFRAY, Assistant in Ophthalmology in the Hospital of Paris. 296 pages with 73 illustrations. Price 5 francs. Paris, 1909. G. Steinheil: 2, rue Casimir-Delavigne, Paris.

The subject is treated comprehensively and without waste of words. The theories of squint are given, but none is accepted as conclusive. The author seems to be influenced by the work of Worth and Landolt, the latter especially.

Binocular vision is described with clearness and accuracy; for its determination the use of Remy's diploscope is advocated. The author considers this instrument to be most useful in examining the motility of the eye, and for orthoptic exercises.

The subject of operations is well treated, with numerous cuts from the works of Landolt and Terrien. For the author, advancement is the operation of choice, tenotomy the exception. He insists on double advancement in those cases of convergent squint in which restoration of binocular vision is possible. Recognizing the fact that accurate dosage of operative effect is impossible, orthoptic exercises are recommended to complete the cure.

A preface by that able surgeon and earnest student, Dr. A. Rochon-Duvignaud, showing his complete accord with the author's conclusions, gives the work added value and authority.

JOHN B. LYNCH.

VI.—**Formulario Ragionato di Oculistica** (Rational Formulary of Ophthalmology). By Trombetta, Professor of Ophthalmology in the University of Turin. Price, 5 francs. S. Lattes & Co.: Turin.

This handbook, intended especially for the general practitioner as the author says, is in fact a very useful guide to the treatment of the diseases of the eyes. The author gives in a condensed and comprehensive manner the definition and main features of each disease, in alphabetical arrangement, and dwells on the treatment, explaining the reason for each indication and recommending only those remedies which experience has proved to be of unquestionable efficiency.

E. DI LEO.

TO ILLUSTRATE DR. KIPP'S ARTICLE ON "RECURRENT HEMORRHAGES IN THE RETINA AND VITREOUS FOLLOWED BY RETINITIS PROLIFERANS IN BOTH EYES IN A YOUNG MAN WITH SURGICAL TUBERCULOSIS"

Dr. A. Braun, pinxit. Right Eye